CHAPTER 20

LIST OF EFFECTIVE TEMPORARY REVISIONS

FOLLOWING IS A COMPLETE LISTING OF ALL ACTIVE TEMPORARY REVISIONS (TR'S). TR'S NOT LISTED SHOULD BE REMOVED. THE ATA NUMBER, CONFIG CODE AND PAGE NUMBER IDENTIFIES THE PAGE PRECEDING THE TR.

TR NUMBER	ATA NUMBER	CONFIG CODE	PAGE NUMBER	TR DATE

NONE

CHAPTER 20

STANDARD PRACTICES - AIRFRAME

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	FITTINGS, LUBRICATION - WING FLAP AND VANE	20-27-02		
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C	CLIPS, CABLE TURNBUCKLE LOCKING	20-27-03		
C	Removal/Installation		401	ALL
C	CONTROL CABLES	20-27-04		
C	Inspection/Check		601	ALL
	STANDARD PRACTICES - FUEL SYSTEM	20-28-00		
	Description and Operation		1	ALL
	COATING, FUEL VAPOR BARRIER AND SEALING, WING PYLON INTERFACE - APPLICATION OF	20-28-03		
	Maintenance Practices		201	ALL
	FUEL AND LUBRICATION LINE ASSEMBLY	20-28-04		
	Maintenance Practices		201	ALL
C	FUEL FEED LINES	20-28-05		
C	Inspection/Check		601	ALL
CR	Approved Repairs		801	ALL
C	FUEL FEED LINE SHROUD	20-28-06		
C	Approved Repairs		801	ALL
C	FUEL FEED LINE SHROUD	20-28-07		
C	Approved Repairs		801	ALL

	Subject	Chapter Section Subject	Page	Effectivity
	STANDARD PRACTICES - FLUID LINES AND FITTINGS	20-29-00		
	Description and Operation		1	ALL
	LINES, FLUID AND FITTINGS - ASSEMBLY	20-29-01		
	Maintenance Practices		201	ALL
	Inspection/Check		601	ALL
C	ASSEMBLY, FLUID LINES AND FITTINGS	20-29-02		
C	Approved Repairs		801	ALL
CR	Repair of Pinhole Leaks in Hydraulic Lines		851	ALL

Subject	Chapter Section Subject	Page	Effectivity
STANDARD PRACTICES - ICE AND RAIN PROTECTION	20-30-00		
STANDARD PRACTICES - INSTRUMENTS	20-31-00		
Description and Operation		1	ALL
PROXIMITY SENSOR ARTIFICIAL TARGET	20-31-01		
Maintenance Practices		201	ALL
STANDARD PRACTICES - LIGHTS	20-33-00		
Description and Operation		1	ALL
SWITCHLIGHT (SQUARE)	20-33-01		
Removal/Installation		401	CONFIG 1 001-031 WITHOUT SB31-063
Removal/Installation		401	CONFIG 2 001-031 WITH SB31-063 AND 032-999
SWITCHLIGHT (RECTANGULAR)	20-33-02		
Removal/Installation		401	ALL
INDICATOR (SQUARE)	20-33-03		
Removal/Installation		401	ALL
INDICATOR (RECTANGULAR)	20-33-04		
Removal/Installation		401	ALL
GROUND START SWITCHLIGHT	20-33-05		
Removal/Installation		401	ALL
STANDARD PRACTICES - OXYGEN (Reference 20-29-00)	20-35-00		
STANDARD PRACTICES - PNEUMATIC	20-36-00		
Description and Operation		1	ALL
COUPLING, SINGLE T-BOLT V-BAND	20-36-01		
Removal/Installation		401	ALL
COUPLING, DOUBLE T-BOLT V-BAND	20-36-02		
Removal/Installation		401	ALL

Subject	Chapter Section Subject	Page	Effec-tivity
STANDARD PRACTICES - WATER/WASTE (Reference 20-29-01)	20-38-00		

Subject	Chapter Section Subject	Page	Effectivity
STANDARD PRACTICES - STRUCTURE	20-51-00		
Description and Operation		1	ALL
BOLTS AND SCREWS	20-51-01		
Maintenance Practices		201	ALL
FASTENERS, MECHANICAL			
PREPARATION FOR AND INSTALLATION OF	20-51-02		
Maintenance Practices		201	ALL
PROTECTION, ANTI-CHAFING -			
OF STRUCTURE CONTACTING			
EXTERNAL DOORS AND FILLETS	20-51-03		
Maintenance Practices		201	ALL
SEALING - ENVIRONMENTAL	20-51-04		
Maintenance Practices		201	ALL
FIREWALLS - SEALING OF	20-51-05		
Maintenance Practices		201	ALL
SEALING, PRESSURE	20-51-06		
Maintenance Practices		201	ALL
PAINT, INTUMESCENT - APPLICATION OF	20-51-07		
Maintenance Practices		201	ALL
FINISHES, TOUCH-UP REQUIREMENTS FOR	20-51-08		
Maintenance Practices		201	ALL
PRIMER, PHOSPHATE ESTER RESISTANT			
APPLICATION OF	20-51-09		
Maintenance Practices		201	ALL
ENAMEL, POLYURETHANE -			
WEATHER RESISTANT, APPLICATION OF	20-51-10		
Maintenance Practices		201	ALL
COATING SYSTEM - EXTERIOR,			
APPLICATION OF	20-51-11		
Maintenance Practices		201	ALL
INSULATION, FIBERGLASS BATT			
FABRICATION AND INSTALLATION OF	20-51-12		
Maintenance Practices		201	ALL
INSERTS, POTTED - HONEYCOMB PANEL	20-51-13		
Approved Repairs		801	ALL
ADHESIVES, APPLICATION OF	20-51-15		
Maintenance Practices		201	ALL
STANDARD PRACTICES - WINGS	20-57-00		
Description and Operation		1	ALL
SCREWS, CAPTIVE	20-57-01		
Removal/Installation		401	ALL
BUSHING - TAPERED THREADED, AND			
NUT-WITHIN-NUT	20-57-02		
Removal/Installation		401	ALL

	Subject	Chapter Section Subject	Page	Effectivity
	AIRCRAFT APPEARANCE	20-90-00		
R	Maintenance Practices		201	ALL
	EXTERIOR WASHING - AIRCRAFT APPEARANCE	20-90-01		
	Maintenance Practices		201	ALL
	SURFACES, INTERIOR DECORATIVE CLEANING PROCEDURES FOR	20-90-02		
	Maintenance Practices		201	ALL

STANDARD PRACTICES - AIRFRAME

R 1. General

R Standard practices pertaining to the airframe are contained in
R this section.

TRI-WING FASTENERS - REMOVAL AND INSTALLATION

1. General

Tri-wing fasteners, utilizing high performance recesses, are used throughout the L-1011 airplane.

C The 10-32 bolt is the most commonly used bolt on access panels.
C Therefore, the most attention will be given to this size at this
C time.

C With all 10-32 recess fasteners, the most common problem is
C overtorque into anchor nuts. The following information will
C assist in applying torque:

C The required torque for a 10-32 bolt is only 12-15 inch
C pounds.

C A 10-32 bolt may require up to 30 inch pounds torque to
C install in an anchor nut due to drag on side walls of hole.

C Remember with a speed handle it is easy to apply over 200
C inch pounds of torque.

CR With a plain screw driver over 100 inch pounds torque may be
C applied.

C CAUTION: DO NOT OVERTORQUE.

C For repair ranges of other size fasteners, see Figure 403.

C NOTE: When installing any bolt, the best results can be
C obtained when the driver is perpendicular to the recess:
C HOLD THE DRIVER STRAIGHT.

2. Equipment and Materials

Tri-wing driver bits - all sizes

Ratchet driver

Speed handle driver

Screwdriver

Torque limiters

Torque wrench

Pneumatic reversible gun

Difficult removal tools (Ref. Fig. 401)

"T"-Handle

Impact torque tool

Leverage bar

Rivet gun and "woodpecker"

Set of threading screw extractors

NOTE: The above includes a list of optional drivers, whichever is available or preferred may be used. Below are listed the TWA Stock Numbers for the drivers for Tri-wing fasteners.

BOLT SIZE	TRI-WING RECESS SIZE	NAS P/N	TWA STOCK NUMBER
2 - 56	(1)	NAS4005D4-1	47-3617
4 - 40	(2)	NAS4005D4-2	47-3618
6 - 32	(3)	NAS4005D4-3	47-3619
8 - 32	(4)	NAS4005D4-4	47-3571
10 - 32	(5)	NAS4005D4-5	47-3572
1/4 - 28	(6)	NAS4005D4-6	47-3573
5/16 - 24	(7)	NAS4005D4-7	47-3574
3/8 - 24	(8)	NAS4005D4-8	47-3575
7/16 - 20	(9)	NAS4005A10-9	47-3620
1/2 - 20	(10)	NAS4005A10-10	47-3621
9/16 - 18	(11)	NAS4005A11-11	47-3622

3. Removal/Installation

A. Removal - Normal

(1) Select proper size bit and insert in appropriate driver (Ref. Fig. 402).

(2) Insert end of bit into recess in head of screw/bolt ensuring that there is no wobble in the bit.

(3) Hold screw/bolt and back off nut or back out screw/bolt as appropriate.

B. Removal - Difficult

Difficulty can be encountered removing Titanium screws initially installed on the airplane. In most cases it will be due to the extreme galling characteristics of Titanium and overtorqued screws. The overtorqueing is easy to do because of the inherent capabilities of the high performance Tri-wing recess. In turn the galling action results, for all intent and purposes, forming a locking device requiring extreme torque to unseat.

Paint and dirt may also cause severe difficulty in removing the screws. Some of the screws are of the reduced head type. These reduced head screws possess a one size smaller recess than normally would be found on a like standard screw head. The recesses are easily damaged under these adverse conditions. It will help to clean or chip out the dirt or paint from the recess before applying the driver bit.

When difficulty is experienced in the removal of a screw/bolt it may be necessary to use a tool which exerts more force to hold the driver bit in the recess. Some
R suggested tools are listed in Paragraph 2., Equipment and
R Materials, under Difficult Removal Tools.

R CAUTION: WHEN USING AN IMPACT TORQUE TOOL, DO NOT APPLY
R EXCESSIVE VERTICAL LOADS THROUGH THE AXIS OF THE
R FASTENERS BEING REMOVED. SUCH LOADS CAN RESULT IN
R STRUCTURAL FAILURE.

As a last resort, it may be necessary to drill the screw/bolt and use a threading screw extractor. To accomplish this use the following procedures:

(1) Select proper size drill (Ref. Table 401) and drill hole through center of screw/bolt.

NOTE: Reduced drilling speed must be used with titanium screws/bolts.

(2) Insert proper size threading screw extractor (Ref. Table 401) into drilled hole and back out the screw/bolt.

Threading Screw Extractors
Table 401

SCREW SIZE	DRILL SIZE	EXTRACTOR NUMBER
3/16 to 1/4	5/64	1
1/4 to 5/16	7/64	2
5/16 to 7/16	5/32	3
7/16 to 9/16	1/4	4
9/16 to 3/4	17/64	5
3/4 to 1	13/32	6
1 to 1-3/8	17/32	7
1-3/8 to 1-3/4	13/16	8
1-3/4 to 2-1/8	1-1/16	9
2-1/8 to 2-1/2	1-5/16	10
2-1/2 to 3	1-9/16	11
3 to 3-1/2	1-15/16	12

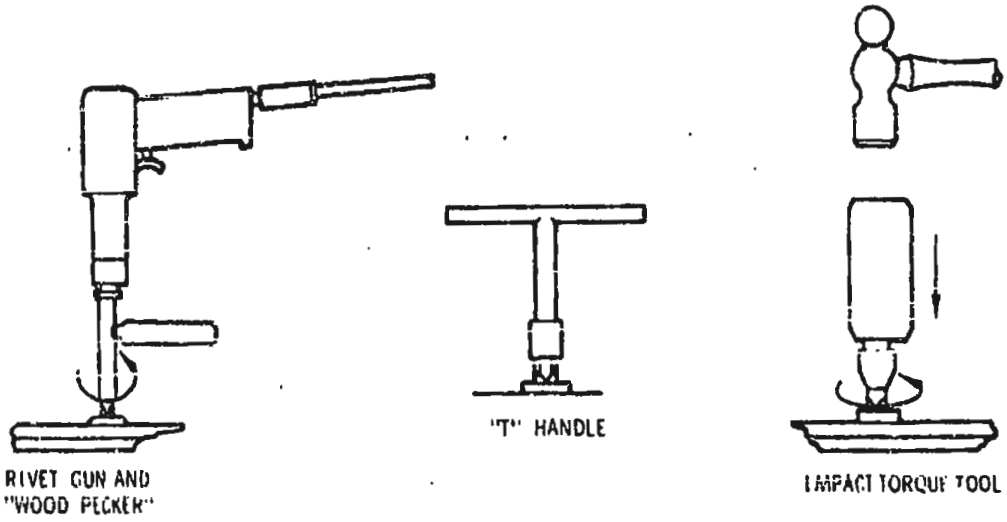
C. Installation

(1) Select the correct screw/bolt for the application.

(2) Select the proper size bit and insert in appropriate driver (Ref. Fig. 401).

(3) Insert end of bit into recess in head of screw/bolt ensuring that there is no wobble in the bit.

(4) Hold screw/bolt and tighten nut or drive screw/bolt as appropriate. Ensure that screw/bolt is properly started to avoid cross threading. Avoid excessive torque. It is recommended that personnel who have been accustomed to driving Philips head screws by feel use a torque wrench when driving tri-wing fasteners.



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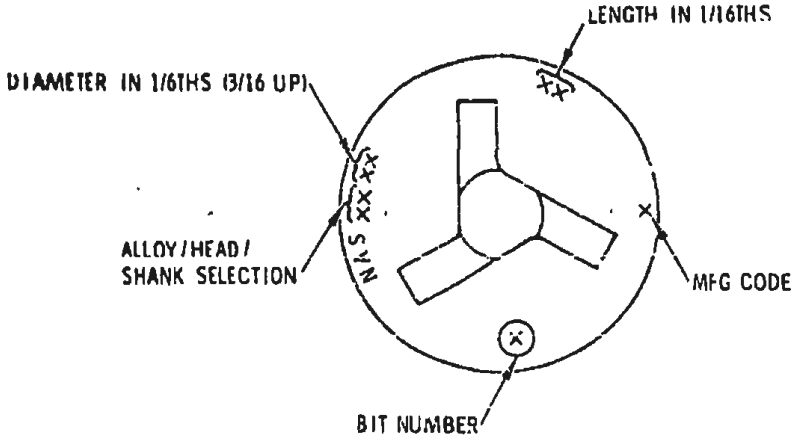
Difficult Removal Tools
Figure 401



RECESS NUMBER	THREAD SIZE			
	FILLISTER, OVAL, PAN, HEX, 100 DEGREE TENSION HEAD	WRENCH TORQUE POUND-INCHES	100 DEGREE SHEAR HEAD	WRENCH TORQUE POUND-INCHES
0 1 2 3	0 - 80 2 - 56 4 - 40 6 - 32	NON-STRUCTURAL TIGHTEN ENOUGH TO MAKE SECURE		
4 5 6 7	8 - 32 10 - 32 14 - 28 5/16 - 24	12 - 15 25 - 30 60 - 65 110 - 125	10 - 32 1/4 - 28 5/16 - 24 3/8 - 24	10 - 12 20 - 25 40 - 50 70 - 80
8 9 10 11 12	3/8 - 24 7/16 - 20 1/2 - 20 9/16 - 18 5/8 - 18	185 - 205 300 - 330 465 - 510 675 - 735 925 - 1000	7/16 - 20 1/2 - 20 9/16 - 18 5/8 - 18 3/4 - 16	110 - 125 175 - 190 255 - 275 345 - 275 585 - 635
13 14 15	3/4 - 16 7/8 - 14 1 - 12	1560 - 1700 2500 - 2700 3800 - 4100	7/8 - 14 1 - 12	935 - 1000 1400 - 1500

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Driver Bit Selection
Figure 402

WRENCH TORQUE IN POUND-INCHES FOR STRAIGHT SHANK STEEL BOLTS AND SCREWS (125,000 PSI TENSILE STRENGTH AND GREATER) WITH PLAIN, SELF LOCKING AND CASTELLATED NUTS			WRENCH TORQUE IN POUND-INCHES FOR BRASS AND ALUMINIUM FASTENERS
BOLT OR SCREW SIZE	STANDARD OR TENSION NUTS	SHEAR NUTS	SHEAR NUTS
	FINE THREAD SERIES		FINE THREAD SERIES
NO. 10 - 32	25 - 30	10 - 12	10 - 15
1/4 - 28	60 - 65	20 - 25	20 - 32
5/16 - 24	110 - 125	40 - 50	40 - 60
3/8 - 24	185 - 205	70 - 80	70 - 100
7/16 - 20	300 - 330	110 - 125	110 - 165
1/2 - 20	465 - 510	175 - 190	175 - 255
9/16 - 18	675 - 735	255 - 275	
5/8 - 18	925 - 1000	345 - 375	
3/4 - 16	1560 - 1700	585 - 635	
7/8 - 14	2500 - 2700	935 - 1000	
1 - 12	3800 - 4100	1400 - 1500	
1-1/8 - 12	5400 - 5800	2000 - 2200	
1-1/4 - 12	7400 - 8100	2800 - 3000	
	COARSE THREAD SERIES		
NO. 8 - 32	12 - 15	7 - 9	
10 - 24	20 - 25	12 - 15	
1/4 - 20	40 - 50	25 - 30	
5/16 - 18	80 - 90	48 - 55	
3/8 - 16	160 - 185	95 - 110	
7/16 - 14	235 - 255	140 - 155	
1/2 - 13	400 - 480	240 - 290	
9/16 - 12	500 - 700	300 - 420	
5/8 - 11	700 - 900	420 - 540	
3/4 - 10	1150 - 1600	700 - 950	
7/8 - 9	2200 - 3000	1300 - 1800	
1 - 8	3700 - 5000	2200 - 3000	
1-1/8 - 8	5500 - 6500	3300 - 4000	
1-1/4 - 8	6500 - 8000	4000 - 5000	

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CR
CR

Wrench Torque Values
Figure 403

EFFECTIVITY: ALL

002B

CONTROL CABLES - INSPECTION AND CHECK

1. General

The L-1011 control cables include standard steel cables and Lockclad cables. A Lockclad cable consists of a standard steel cable with an aluminum tube swaged around the steel cable to improve stiffness and protect the steel cable against wear and corrosion.

R This section defines wear limits for the steel cable of both the
R standard and Lockclad cables, for the Lockheed cable covering and for control cable pulleys.

2. Equipment and Materials

Solvent, Federal Specification P-D-680 (Dry Cleaning Solvent), or equivalent

Compound, Corrosion Preventive, Cold Application, Transparent, Non-tacky, MIL-C-16173D, Grade 4, Tectyl 846, Ashland Oil Co., Ashland, Kentucy, or equivalent.

C Cable Corrosion Prevention Material per 20-27-04,601

3. Referenced Procedure

	20-00-02	Control Cables - Repair of Heat Shrinkable Tubing Covering - Approved Repairs
C	20-27-04	Control Cables - Inspection/Check

4. Inspection/Check - Steel Cable

C NOTE: Refer to 20-27-04, 601 for flex cable inspection/check
C policies.

A. Definitions (Ref. Fig. 601)

(1) Aircraft cable wire:

A thin (small diameter) individual steel rod or thread.

NOTE: Two wires are joined end-to-end during manufacture by a "twist" splice. Such a wire splice is not a cable defect.

(2) Aircraft cable strand:

A group of wires helically wound (laid) together in a continuous run.

(3) Aircraft cable:

A group of strands helically twisted or laid about a central straight strand in a continuous run.

B. Nicked, Cut, Kinked, or Bent Cables

(1) Nicked cables indicate wire and strand damage. Replace nicked cables.

(2) Cut cables indicate strand damage such as broken wires plus other partial wire damage. Replace cut cables.

(3) Kinked cables indicate that wires and strands have experienced permanent set. This type of damage is detrimental to both cable strength and operation. Replace kinked cables.

(4) Bent cables may be returned to service if following requirements are met after straightening:

(a) The maximum outer diameter of cable in area of the bend does not exceed outer diameter of a new cable.

Sample Part Number: LS10403 DG "3" A151

Cable diameter in 1/32 inch increments - "3" equals 3/32 inch.

(b) Any polyolefin covering used on cable is undamaged or has been repaired (Reference 20-00-02).

C. Broken Wires

(1) To inspect for broken wires, pass a cloth along the length of the cable. Broken wires are indicated where the cloth is snagged. To aid visual inspection, remove tension and bend cable so that broken wire ends tend to project from the cable surface. Use generous bend radius to avoid kinking.

R (2) Replace cables that fail the following criteria:

R Acceptance/rejection of 7 X 7 control cables:

(a) Critical Fatigue Areas - Replace cables having more than two broken wires in any strand in a critical fatigue area or more than three broken wires total in a critical fatigue area.

NOTE: A "Critical Fatigue Area" is defined as the working length of a cable that runs over, under or around a pulley, or through a fairlead. In addition any point within 12 inches of a swaged fitting is a critical fatigue area. Pressures exerted on fittings during swaging sometimes pinch wires resulting in broken wires.

(b) Non-critical Fatigue Areas - Replace cables having more than two broken wires in any strand in any 12 inch length. Replace cables having more than four broken wires total in any 12 inch length.

(c) Worn Wires - Replace cables having more than three wires worn more than half way through the wire diameter per inch or with more than two worn spots within the same circumference of the strand or cable assembly.

NOTE: The cable shall be considered serviceable if broken wires, subject to previously stated limits, are present but not in the worn area. One less worn wire per inch is allowable for each broken wire present in the same inch.

Acceptance/rejection of 7 x 19 control cables:

(a) Critical Fatigue Areas - Replace cables having more than three broken wires per inch in the critical fatigue area or more than six broken wires total in the critical fatigue area.

NOTE: A "Critical Fatigue Area" is defined as the working length of a cable that runs over, under or around a pulley, or through a fairlead. In addition any point within 12 inches of a swaged fitting is a critical fatigue area. Pressures exerted on fittings during swaging sometimes pinch wires resulting in broken wires.

R
R
R

(b) Non-critical Fatigue Areas - Replace cables having more than three broken wires per inch in any one strand. Replace cables having more than six broken wires in any two inch length.

R (c) Worn Wires - Cable wear should not be considered
R for cable removal criteria.

R D. Corrosion

(1) Examine dark reddish brown or discolored areas for evidence of corrosion. Check any cable with a broken wire in a free run for rust or corrosion damage. Use magnifying glass (10 power or greater for small diameter wire) to determine extent of damage.

C NOTE: Clean cable by wiping with clean dry rag to remove cable lubricant and corrosion from area to be examined.

(2) Corrosion is considered light if:

(a) External wires are not pitted.

(b) Zinc or tin plating is still present in valleys between strands. Such plating will appear as silver colored specks between the strands.

(c) Rust is not present in valleys between strands of cable.

(3) Corrosion is heavy if any of the following conditions are in evidence:

(a) External wires are pitted.

(b) Reddish brown rust exists in valleys between strands of cable.

(c) A wire is broken in the corroded area.

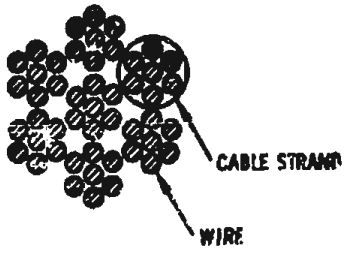
(d) The cable appears swollen due to rust.

(4) Cables which fall into the light corrosion category may remain in service. Remove all corrosion deposits and
C treat cable with Corrosion Prevention Material for corrosion prevention. Replace heavily corroded cables.

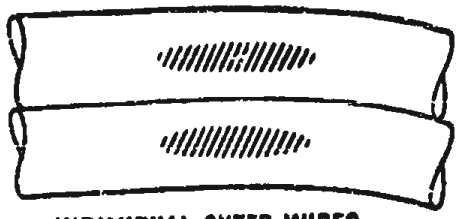
5. Inspection/Check - Lockclad Cable Covering

A. General

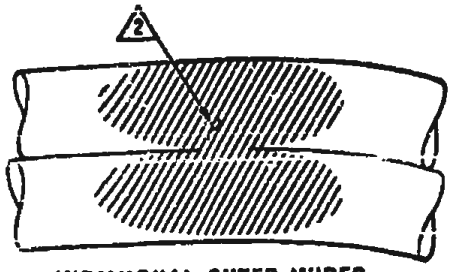
The Lockclad cable aluminum tube covering is not required as a load-carrying part of the cable assembly; consequently the aluminum tubing can be worn completely through to the steel



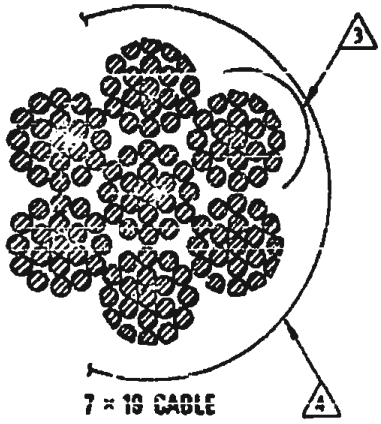
7 × 7 CABLE



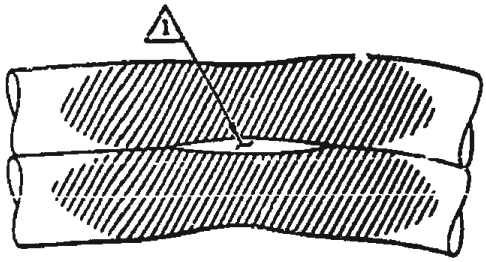
INDIVIDUAL OUTER WIRES WORN LESS THAN 50% (WORN AREAS INDIVIDUALLY DISTINGUISHABLE)



INDIVIDUAL OUTER WIRES WORN 40-50% (NOTE BLENDING OF WORN AREAS)



7 × 19 CABLE



INDIVIDUAL OUTER WIRES WORN MORE THAN 50%

EXAMPLE OF INTERNAL WEAR

NOTE

1. VISIBLE SPACE BETWEEN WIRES.
2. WEAR CONDITION RESULTING IN BLENDED SURFACES BETWEEN WIRES.
3. TYPICAL OUTER WIRE WEAR AREA ON CABLE STRAND. EITHER VISIBLE SPACE BETWEEN WIRES (1) OR FULLY BLENDED SURFACE (2) OVER APPROXIMATELY SIX WIRES INDICATES 50 PERCENT WIRE WEAR.
4. TYPICAL CABLE WEAR MAY OCCUR ON ONE SIDE ONLY OR ON FULL CIRCUMFERENCE AND MAY EXTEND ALONG THE CABLE FOR A DISTANCE EQUAL TO NORMAL CABLE TRAVEL.

M1-0102-20-008

Cable Wear Patterns
Figure 601

cable without degrading rated strength of the cable assembly.

The aluminum tubing has a nominal thickness of 0.035 inch. Partial loss of the aluminum tubing over a few inches affects the cable stiffness only a negligible amount, but exposed steel cable is now vulnerable to corrosion and wear.

C If the Lockclad cable aluminum tube is worn through to the
C steel cable, refer to 20-27-04,601. If clad is not worn through, repair per repair procedure (Ref. 20-00-02/801).

If the lockclad cable aluminum tube shows any significant local wear, the life of the lockclad cable can be extended by rotating the lockclad cable 180 degrees circumferentially to provide a new lockclad surface to the fairlead roller. It should be noted that the cable assembly should not be rotated end-for-end.

6. Control Cable Pulleys

A. General

Pulley failure is usually caused by failure of the pulley bearings. Replace pulleys that have rough or sticking bearings.

Replace broken, cracked or excessively worn pulleys. A pulley is considered excessively worn if the root diameter of the pulley is reduced by 1/32 inch. This measurement is taken across the highest point of the cable helix impression left on the pulley.

CONTROL CABLES
REPAIR OF HEAT SHRINKABLE TUBING COVERING AND WORN CLAD

CR

1. General

Protective heat shrinkable tubing is installed on Lockclad Control Cables whenever they would be susceptible to corrosion.

CR An epoxy filler may be used to build-up worn clad areas.

2. Equipment and Materials

Methyl-Ethyl-Ketone, Federal Specification TT-M-261

CR Aluminum filled epoxy - Devcon F.

Polyurethane Conformal Coating, Military Specification MIL-I-46058, Type PUR (PR 1568, Products Research and Chemical Corp.)

One-inch paint brush

NOTE: Equivalent materials may be used.

3. Repair of Heat Shrinkable Tubing

A. Procedures

WARNING: USE SOLVENT IN WELL-VENTILATED AREA. AVOID FLUID CONTACT WITH SKIN AND EYES. PROLONGED EXPOSURE MAY RESULT IN SKIN OR EYE IRRITATION. KEEP AWAY FROM HEAT, SPARKS AND OPEN FLAME. FAILURE TO COMPLY MAY RESULT IN MATERIAL COMBUSTION.

CAUTION: DO NOT ALLOW SOLVENT TO BECOME ENTRAPPED BENEATH THE HEAT SHRINKABLE TUBING.

(1) Clean damaged area and adjacent tubing for a minimum of 1/4-inch around the damaged area using a clean cloth dampened with Methyl-Ethyl-Ketone.

(2) Wipe dry with a clean dry cloth before the solvent evaporates.

(3) Apply a brush coat of Polyurethane Conformal Coating over the damaged area, extending approximately 1/4-inch beyond the damage on all sides.

(4) Allow to air dry to a tack-free condition for approximately one hour.

(5) Apply a second brush coat over the first coat.

(6) Allow to air cure for a minimum of two days at approximately 75 degrees Fahrenheit (23.9 degrees Centigrade) before being subjected to possible fluid contact.

NOTE: Coating cure may be accelerated by heating at 180 degrees Fahrenheit (82.2 degrees Centigrade) for three hours.

4. Replacement of Heat Shrinkable Tubing to Control Cables

A. Procedure

(1) Remove all grease, oil, and foreign matter from the surface to be covered using 4091-C cleaner and clean cloths. Do not allow the cleaner to dry on the surface of the part. Wipe the cable completely clean so that there is no discoloration left on the cloth.

(2) Mix a sufficient amount of adhesive, in accordance with the supplier's instructions, to cover approximately 3 inches at each end of the area where the heat shrinkable tubing is to be applied. Do not mix more than one premeasured kit of adhesive at one time.

(3) Slip the shrink tubing over the Lockclad cable.

NOTE: The tubing I.D. before shrinking should be no more than 1/2 again the diameter of the O.D. of the item being covered.

(4) Using a heat gun, heat the shrink tubing uniformly at 250 to 400°F until the tubing is completely shrunk down.

NOTE: Start the shrink operation at one end of the tubing and continue until the entire length has been shrunk.

(5) Clean any excess adhesive squeeze out from the ends of tubing and the outer surfaces.

NOTE: Do not allow the cleaning solvent to run back under the tubing.

(6) Continue the procedure until the required area has been covered.

(7) Allow the covered Lockclad tubing to set for 24 hours at room temperature to cure the adhesive, or cure for 55 (±10) minutes at 250° (±5°) F.

C 5. Repair of Aluminum Clad on Control Cable

C A. Repair Aluminum Clad that is not worn to expose the cable as C follows:

CR NOTE: This is an optional repair. For best results, remove CR cable to accomplish this repair.

C (1) Inspect to verify that cladding is not worn or cracked C to expose the cable.

C (2) Clean worn clad area with approved solvent.

C (3) Apply aluminum powder filled epoxy to worn area. Use C approved products:

C Epoxy Devcon F, TWA STK NBR 50-0934.

C Mix ratio - by volume 1 part hardner to 4 parts C Devcon F.

C Cure time:

C at 65°F, 3 to 4 hours;

C at 75°F, 1.5 hours;

C at 85°F, 60 minutes.

C (4) Smooth patched area to same diameter as adjacent clad C material after curing.

R

SEALING THREADED STEEL JOINTS - CORROSION PROTECTION

1. General

This section contains procedures for sealing and coating threaded steel joints, such as rods, pins and turnbuckles for protection against corrosion.

2. Equipment and Material

Methyl-Ethyl-Ketone - TT-M-261 or equivalent

Corrosion preventive compound - MIL-C-1673D Grade 4 or equivalent

Petroleum base cleaner - 101KE, Leeder Chemical Co., or equivalent

Trichloroethane - MIL-T-81533A or equivalent

Sealing compound - PR1301HT-K, Products Research Co., or equivalent

Cotton wiping cloths (Cloth) - DDD-R-30 Grade A or equivalent

3. Application

R R WARNING: USE METHYL-ETHYL-KETONE IN WELL VENTILATED AREA. AVOID FLUID CONTACT WITH SKIN AND EYES. PROLONGED EXPOSURE MAY RESULT IN SKIN IRRITATION.

WARNING: USE TRICHLOROETHANE IN WELL-VENTILATED AREA. DO NOT INHALE VAPOR, AND AVOID FLUID CONTACT WITH SKIN. PROLONGED EXPOSURE MAY RESULT IN UNCONSCIOUSNESS OR LUNG OR SKIN IRRITATION.

A. Applying Corrosion Protection

(1) Clean surfaces thoroughly by wiping with cloth dampened with petroleum base cleaner, Methyl-Ethyl-Ketone or Trichlorethane. Wipe dry with clean dry cloth.

(a) Brush coat on frequently disassembled or adjustable threaded steel joints, corrosion preventive compound prior to assembly. Wipe off excess material with clean cloth after assembly.

(b) Apply sealant on fixed or permanent threaded steel joints, such as pins, bolts or shafts, one inch diameter or less, prior to assembly.

NOTE: Make sure that all exposed threads are completely coated after wiping excess sealant.

(c) Apply sealant on fixed or permanent pins, bolts or shafts, one inch diameter or less, installed through bushings or bearing rotating joints, ot threads of mating nut. Spread excess sealant over exposed threads after installation.

(d) Coat entire part, on fixed or permanent pins, bolts or shafts, one inch diameter or larger, with corrosion preventive compound prior to assembly.

(2) Cure sealing compounds at ambient conditions above 70 degrees farhrenheit or accelerate by heat curing at temperatures up to 135 degrees fahrenheit or 57.2 degrees centigrade until a full cure is attained.

NOTE: Cure sealing compounds to a tack free condition before subjected to cleaning fluids or pressurization.

NOTE: Accomplish application of sealing compounds in an area where temperature is between 60 and 100 degrees fahrenheit or 15.6 and 37.8 degrees centigrade and relative humidity is between 20 and 85 percent.

NOTE: Mark freshly mixed sealing compounds to identify material specification and class of sealant. Store pre-mixed frozen sealant at -20 degrees fahrenheit, -28.89 degrees centigrade or below.

(3) Overcoat exposed sealant with polyethylene tape to avoid contamination. Remove tape when sealant becomes tack-free, as evidenced by non-adherence of tape to sealant.

NOTE: Cover uncured extrudable sealant immediately after application. Allow a solvent flashoff of one hour before covering brush type polysulfide sealant.

CAUTION: DO NOT USE AN ACID PAINT STRIPPER ON STEEL PARTS.

(4) Clean parts and joints, that were disassembled after sealing operation, with a non-embritting alkaline paint

R stripper followed by wiping with cloth moistened with
R Methyl-Ethyl-Ketone.

R (5) Inspect each joint after installation to ensure
R functional capability has not been impaired by the
R presence of sealing compound.

R NOTE: Transport parts in such a manner ensuring that
R required physical characteristics and properties
R are preserved.

R SURFACE PREPARATION OF PARTS FOR ADHESIVE BONDING

R 1. General

R This section contains procedures and requirements for surface
R preparation of detail parts for adhesive bonding.

R 2. Equipment and Materials

R Acetone, Technical - FP3F, Toxic - or equivalent

R Hydrochloric Acid - O-H-765A - or equivalent

R Hydrofluoric Acid, Technical - O-H-795 - or equivalent

R Nitric Acid, Technical - O-N-350A - or equivalent

R Sodium Dichromate, Technical - O-S-595B - or equivalent

R Sodium Phosphate, Technical - O-S-642 - or equivalent

R Sulphuric Acid - O-S-801 Class 3 - or equivalent

R Sulphuric Acid, Technical - O-S-809 - or equivalent

R Tetrachloroethylene, Technical - O-T-236 - or equivalent

R Trichloroethylene, Technical - O-T-634 - or equivalent

R Alkaline Cleaner - RC-436 B(1) - or equivalent

R Methyl-Ethyl-Ketone - TT-M-261 B - or equivalent

R Naphtha, Aliphatic - TT-N-95 B(1) Type II - or equivalent

R Naphtha, Aromatic - TT-N-97 B Type I - or equivalent

R Thixotropic Filler - Santocel, Monsanto Chemical Co. - or
R equivalent

R Nylon Fabric - Plain Weave (38 to 50) x (38 to 50) 210 x 210
R Denier, 2.3 oz./sq. yd. min. 45 inch wide - or equivalent

R Indicator Paper - F7-0-00 - or equivalent

R Potassium Fluoride Dihydrate, Technical - or equivalent

R Barium Sulfate, Technical - or equivalent

R Abrasive Pad - MIL-A-9962 Type 1 - or equivalent

R Abrasive Wheel - Very Fine Type A, 3M Co., - or equivalent

R Abrasive Pad, Impregnated Nylon - Pad No. 74, 3M Co., - or
R equivalent

R Steel Alloy Cleaning and Passivating Compound - Pasa Jell 105,
R Products Research and Chemical Corp., - or equivalent

R Titanium Cleaning and Passivating Compound - Pasa Jell 107,
R Products Research and Chemical Corp., - or equivalent

R Surface Compound Preparation - Prebond 700, Bloomingdale Rubber
R Co., - or equivalent

R Toluene, Technical - TT-T-548 - or equivalent

R Cotton Wiping Cloth - DDD-R-30, Grade A - or equivalent

R Sand - MIL-S-17726 - or equivalent

R Trichloroethane - MIL-T-81533 - or equivalent

R Aluminum Alkaline Type Cleaner - Turco Aviation Cleaner, Turco
R Products Inc., - or equivalent

R Heavy Duty Alkaline Cleaner for Aluminum-Emulsion spray - or
R equivalent

R Alkaline Type Cleaner for Aluminum - 4215-NC-LT, Turco Products
R Inc., - or equivalent

R 3. Preparation

R A. General Preparation of Parts for Bonding

R WARNING: USE SOLVENT IN WELL-VENTILATED AREA. DO NOT
R INHALE VAPOR AND AVOID FLUID CONTACT WITH SKIN AND
R EYES. PROLONGED EXPOSURE MAY RESULT IN NAUSEA OR
R SKIN OR EYE IRRITATION.

R WARNING: KEEP SOLVENT AWAY FROM HEAT, SPARKS AND OPEN
R FLAME. FAILURE TO COMPLY MAY RESULT IN MATERIAL
R COMBUSTION.

R CAUTION: DO NOT TOUCH BONDING SURFACES WITH BARE HANDS
R AFTER CLEANING. AVOID TOUCHING BONDED SURFACES
R WHILE WEARING GLOVES.

(1) Degrease parts by handwiping with a clean cloth saturated with Methyl-Ethyl-Keton, Acetone, Toluene or Aliphatic Naphtha.

(2) Wipe dry with clean cloth before solvent has evaporated.

(3) Remove mill marks by handwiping with a clean cloth.

(4) Vapor degrease if PH of degreasing fluid is between 6.4 and 10.5.

NOTE: Maximum immersion time for parts is 15 minutes.

NOTE: Wear clean white gloves during handling of cleaned parts.

(5) Immerse parts for 10 to 15 minutes in Oakite No. 61B and No. 164, maintaining a concentration of four to seven ounces of alkaline cleaner per gallon of tap water and a temperature of 160 to 180 degrees Fahrenheit or 71.1 degrees to 82.2 degrees Centigrade.

(6) Rinse parts cleaned with alkaline cleaner by spraying or immersing followed by a spray rinse with clean water for a minimum of one minute at a temperature between 50 to 150 degrees F or 10.0 to 65.6 degrees.

CAUTION: RE-ETCH ALUMINUM ALLOYS FOR ONE FULL RE-ETCH CYCLE ONLY.

(7) Acid etch parts by immersing in aqueous solution for eight to twelve minutes. Use a concentration of 34.0 to 40.0 oz/gal. by weight of sulphuric acid, 3.5 to 10.2 oz/gal. by weight of sodium dichromate and clean water to make up balance of solution.

NOTE: Maintain solution at a temperature of 145 to 160 degrees F or 62.8 to 71.1 degrees C.

R (8) Remove etchant by spraying or immersing parts with
R clean water having a temperature of 50 to 150 degrees F or 10.0 to 65.6 degrees C.

NOTE: Rinse for a minimum of three minutes.

(9) Force dry parts in a circulating-air oven, maintained at a maximum temperature of 140 degrees F or 60.0 degrees C for a minimum of ten minutes or until dry.

NOTE: Control air in oven to preclude contamination of parts.

R NOTE: Prime parts in accordance with applicable
R bonding specification.

R NOTE: Control to avoid contaminating cleaned metal
R surfaces prior to application of primer in metal
R cleaning and adjacent areas.

R NOTE: Wrap and adequately protect cleaned parts when
R transporting through uncontrolled areas.

R NOTE: Suitably protect cleaned details from
R contamination immediately after cleaning.

R 4. Method 1

R A. Automated Spray Preparation

R (1) Preclean parts by spraying with heavy duty alkaline
R cleaner, made up in accordance with manufacturer's
R recommendations using tap water. Solution temperature
R in tank to be 150 to 170 degrees F or 65.6 to 76.7
R degrees C and spray parts for a minimum of one minute.

R (2) Spray parts after preclean with tap water, at a tank
R temperature of 50 to 150 degrees F or 10.0 to 65.6
R degrees C for a minimum of one minute.

R (3) Alkaline clean parts by spraying with a solution of
R heavy duty alkaline cleaner, made up in accordance with
R manufacturer's recommendations using clean water.
R Maintain solution temperature in tank at 150 to 170
R degrees F or 65.6 to 76.7 degrees C and spray parts for
R a minimum of one minute.

R NOTE: Clean water is defined as demineralized or
R deionized water or water with a mineral content
R of less than fifty parts per million (ppm)
R solids.

R (4) Spray parts after alkaline cleaning with tap water at a
R tank temperature of 50 to 150 degrees F, or 10.0 to
R 65.6 degrees C for a minimum of 40 seconds followed by
R an additional spray rinse with clean water at a
R temperature of 50 to 150 degrees F or 10.0 to 65.6
R degrees C for a minimum of 20 seconds.

R (5) Acid etch parts by spraying with a solution of 36 to 44
R ounces by weight of Sulfuric Acid, and 4.0 to 5.0
R ounces by weight of Sodium Dichromate per gallon, and
R tap water to make up balance of solution. Spray
R solution on parts for a minimum of two minutes.

R NOTE: Solution temperature in tank to be 145 to 160
R degrees F or 62.8 to 71.1 C.

R (6) Spray rinse after acid etch with tap water for a
R minimum of one minute followed by a final spray rinse
R with clean water for a minimum of one minute.

R NOTE: Tank temperature using tap water and clean water
R rinse to be maximum 100 degrees F or 37.8 C.

R (7) Check parts with water break, if water break occurs,
R repeat sequence 4A(3) through 4A(6).

R NOTE: Limit re-etch to four cycles.

R NOTE: Water break free condition is when water is
R applied momentarily to the surface, water will
R remain on the surface in an even continuous film
R without a break for a brief period of time and
R contain no residue detrimental to the subsequent
R adhesive bonding process.

R (8) Air dry parts at a maximum temperature of 140 degrees F
R or 60.0 C until water free.

R 5. Method II

R A. Chromic Acid Anodizing

R CAUTION: PROTECT CHROMIC ACID ANODIZED SURFACES FROM
R CONTAMINATION.

R (1) Chromic acid anodize parts after prefitting and prior
R to application of adhesive.

R NOTE: Omit immersion in sodium dichromate, nickel
R acetate solutions and hot rinses following
R anodizing.

R (2) Rinse parts in cold clean water after anodizing which
R is adequate to remove all residual free acid.

R (3) Dry parts using clean dry air at a maximum temperature
R of 160 degrees F or 71.1 degrees C.

R NOTE: Locate contact marks in excess trim area of
R detail parts when possible. If not possible,
R marks are to be kept to a minimum and surface
R preparation to be the same.

R 6. Method III

R A. Sulfuric Acid Anodizing

R CAUTION: ONLY TYPE II SULFRIC ACID ANODIZING IS USED FOR
R PARTS WHICH ARE TO BE ADHESIVE BONDED.

R (1) Sulfuric acid anodize parts after prefitting and prior
R to application of adhesive.

R (2) Rinse parts in cold clean water after after anodizing
R which is adequate to remove all residual free acid.

R (3) Dry parts using clean dry air at a maximum temperature
R of 70 to 200 degrees F or 21.1 to 93.3 degrees C.

R NOTE: After hot dichromate sealing, rinse all
R dichromate solution from surface of parts.

R NOTE: Thickness of anodic coating on clad surface of
R R one side clad skins is not subject to thickness
R requirements.

R 7. Method IV

R A. Preparation for Bonding

R WARNING: USE SOLVENT IN WELL-VENTILATED AREA. DO NOT
R R INHALE VAPOR AND AVOID FLUID CONTACT WITH SKIN AND
R EYES. PROLONGED EXPOSURE MAY RESULT IN NAUSEA OR
R SKIN OR EYE IRRITATION.

R WARNING: KEEP SOLVENT AWAY FROM HEAT, SPARKS AND OPEN
R R FLAME. FAILURE TO COMPLY MAY RESULT IN MATERIAL
R COMBUSTION.

R (1) Clean parts that are not primed with self-curing
R primers, by wiping with clean cloths dampened in
R R aliphatic naphtha and wipe dry with new clean cloths
R immediately prior to bonding.

R NOTE: Remove adhesive primer in areas that are
R R excessively contaminated by wiping with clean
R cloths dampened with methyl-ethyl-ketone and
R reprime surface.

R (2) Abrade parts having surfaces to be bonded, which have
R R not been primed, with abrasive pads until metal
R surfaces are bright and free of oxides and other
R contamination.

(3) Wipe parts with clean cloths dampened with methyl-ethyl-ketone and wipe dry with clean cloths.

(4) Apply barium sulfate (60 grams) mixed with dichromate-sulfuric acid (30 milliliters) a dichromate-sulfuric paste, after abrading.

(5) Agitate paste at approximately five minutes intervals and remain on surface for a minimum of twenty minutes.

R R CAUTION: DO NOT ALLOW ACID PASTE TO DRY ON PARTS OR TO ENTER BOND JOINTS, HONEYCOMB CORE CELLS OR IN ANY WAY REMAIN PERMANENTLY ON THE PART.

(6) Wipe off excess paste with dry cloth followed by cloths soaked in clean water, then wipe dry with clean cloths.

NOTE: Verify acid paste removal, after removing all traces of barium sulfate, by using indicator paper or other appropriate check for acid presence.

(7) Prime parts with applicable primer within forty five minutes.

(8) R Hand clean previously bonded parts and secondary bonded parts, other than aluminum alloys by wiping parts with clean cloth wet with fresh methyl-ethyl-ketone and wipe dry with clean cloth before solvent has evaporated.

(9) Abrade with clean Scotch-Brite, Type A, very fine wheels or pads until a bright oxide-free surface is obtained.

(10) Remove debris by lightly wiping with clean, dry, lint-free cloths.

(11) Wipe with clean cloth wet with fresh methyl-ethyl-ketone and wipe dry with clean cloth before solvent has evaporated.

8. Method V

A. Degreasing Prior to Prefit

WARNING: USE SOLVENT IN WELL-VENTILATED AREA. DO NOT INHALE VAPOR, AND AVOID FLUID CONTACT WITH SKIN AND EYES. PROLONGED EXPOSURE MAY RESULT IN NAUSEA OR SKIN OR EYE IRRITATION.

WARNING: KEEP SOLVENT AWAY FROM HEAT, SPARKS AND OPEN FLAME. FAILURE TO COMPLY MAY RESULT IN MATERIAL COMBUSTION.

(1) Hand wipe parts with clean cloth saturated with methyl-ethyl-ketone, acetone, toluene, aliphatic naphtha or by vapor degreasing.

(2) Keep PH level fluid between 6.4 and 10.5, tested electrometrically on a water extract of the cleaning fluid.

NOTE: Immerse parts for a maximum of fifteen minutes.

9. Method VI

R A. Prebond Seven Hundred - No Vapor Hone

WARNING: USE SOLVENT IN WELL-VENTILATED AREA. DO NOT INHALE VAPOR AND AVOID FLUID CONTACT WITH SKIN AND EYES. PROLONGED EXPOSURE MAY RESULT IN NAUSEA OR SKIN OR EYE IRRITATION.

WARNING: KEEP SOLVENT AWAY FROM HEAT, SPARKS AND OPEN FLAME. FAILURE TO COMPLY MAY RESULT IN MATERIAL COMBUSTION.

(1) Clean and degrease parts by hand wiping with a clean cloth saturated with methyl-ethyl-ketone, acetone, toluene, aliphatic naphtha or by vapor degreasing.

(2) Remove scale or oxide by alkaline cleaning or pickling (acid clean) as applicable for type of steel.

NOTE: Steel heat treated or cold-worked to strength levels above one hundred eighty (180) thousand pounds per square inch (KSI) and ultimate tensile strength (UTS) are not acid cleaned.

NOTE: Steel parts of strength levels below 180 KSI, UTS will not be acid cleaned in excess of time required to accomplish cleaning parts and at no time exceed immersion time of thirty minutes.

CAUTION: DO NOT SAND BLAST OR ABRASIVE CLEAN ON MATERIAL 0.030 INCH THICK OR LESS.

(3) Remove scale by abrasive cleaning or sandblasting.

R (a) Remove abrasive particles, dust, metallic
R particles or other contamination after abrasive cleaning prior to further processing.

NOTE: Use abrasive cleaning materials no coarser than 150 grit and maintained in a clean condition.

(b) Sandblast dry with aluminum oxide, garnet or sand abrasives.

NOTE: Suitably control operations to assure complete removal of foreign materials from all areas of parts after processing.

(4) Condition surface of parts by immersing in an aqueous solution for five to ten minutes.

(a) Mix solution nine to eleven ounces of surface condition per one gallon of water.

(b) Maintain temperature of solution at 195 to 210 degrees F or 90.0 to 98.9 C.

(5) Rinse parts after surface and conditioning by spray rinsing or immersion rinse followed by spray rinsing in clean water having a temperature of 50 to 150 degrees F or 10.0 to 65.6 degrees C for a minimum of one minute to completely remove cleaner.

(6) Force dry parts in a circulating-air oven, maintain at a maximum temperature of 160 degrees F or 71.1 degrees C for a minimum of ten minutes or until dry.

NOTE: Control air in oven to preclude contamination of parts.

10. Method VII

A. Phosphate-Fluoride of Titanium Alloy Parts

CAUTION: DEGREASED PARTS, THAT CHLORINATED SOLVENTS WERE USED, MUST BE ALKALINE CLEANED AND ACID PICKLED WITHIN FOUR HOURS.

CAUTION: DO NOT USE CHLORINATED SOLVENTS TO CLEAN TITANIUM ALLOYS EXCEPT TITANIUM FLOORBOARDS, FAIL SAFE STRAPS AND FASTENERS INSTALLED IN ALUMINUM STRUCTURE. TRICHLOROETHANE OR SAFETY SOLVENT MAY BE USED.

R (1) Prepare parts to be bonded, after prefitting and immediately prior to application of adhesive by degreasing, alkaline cleaning, pickling and rinsing.

R WARNING: USE SOLVENT IN WELL-VENTILATED AREA. DO NOT INHALE VAPOR AND AVOID FLUID CONTACT WITH SKIN AND EYES. PROLONGED EXPOSURE MAY RESULT IN NAUSEA OR SKIN OR EYE IRRITATION.

R WARNING: KEEP SOLVENT AWAY FROM HEAT, SPARKS AND OPEN FLAME. FAILURE TO COMPLY MAY RESULT IN MATERIAL COMBUSTION.

R (a) Degrease parts by handwiping with clean cloth dampened with acetone, isopropyl alcohol, methyl-ethyl-ketone, ketone, dry cleaning solvent, non-halogenated safety solvent, toluene or xylene.

R (b) Alkaline clean parts prior to acid cleaning by immersing parts in alkaline cleaner operated at 180 to 212 degrees F or 82.2 to 100.0 degrees C for a minimum of 15 minutes.

R NOTE: Use 8-16 oz/gal. of alkaline cleaner without the use of an electric current.

R (c) Immerse parts in pickling solution for a sufficent time to remove 0.0004 to 0.0006 inch of material.

R NOTE: Solution is composed of 2.3 to 3.3 ounces by weight of hydrofluoric acid, 38 to 52 ounces by weight of nitric acid and water to make up one gallon of solution.

R NOTE: Replenish solution when metallic concentration exceeds one part metal of 1.8 parts hydrofluoric acid or when hydrofluoric acid exceeds five percent by weight.

R (d) Rinse parts in clean water for a minimum of two minutes following pickling.

R B. Phosphate Conversion Coating of Titanium Alloy Parts

R (1) Immerse parts in an ambient temperature, aqueous solution for two to three minutes.

R NOTE: Solution concentration of 6.04 to 7.62 ounces per gallon of trisodium phosphate, 2.42 to 3.05 ounces per gallon of potassium fluoride, 3.87 to 4.68 ounces per gallon of hydrofluoric acid,

R fifty percent hydrofluoric acid technical grade
R and water to make up balance of solution.

R (2) Rinse parts in ambient temperature water for a minimum
R of two minutes, followed by immersing parts for a
R minimum of 15 minutes, in clean water having a
R temperature of 140 to 185 degrees F or 60.0 to 85.0
R degrees C.

R NOTE: Water used for immersion rinsing is free of
R contaminants which would interfere with
R subsequent processing or which would stain,
R discolor or deposit a residue on parts.

R (3) Force dry parts in a circulating air oven, maintained
R at 160 degrees F maximum or 71.1 degrees C maximum for
R a minimum of ten minutes or until dry.

R NOTE: Control air in oven to preclude contamination of
R cleaned parts.

R 11. Method VIII

R A. Metallic Honeycomb Core Preparation

R (1) Examine honeycomb core for contamination.

R (2) Remove dry contamination by carefully blowing clean dry
R compressed air over surface.

R WARNING: USE SOLVENT IN WELL-VENTILATED AREA. DO NOT
R INHALE VAPOR AND AVOID FLUID CONTACT WITH SKIN AND
R EYES. PROLONGED EXPOSURE MAY RESULT IN NAUSEA OR
R SKIN OR EYE IRRITATION.

R WARNING: KEEP SOLVENT AWAY FROM HEAT, SPARKS AND OPEN
R FLAME. FAILURE TO COMPLY MAY RESULT IN MATERIAL
R COMBUSTION.

R (3) Spray or flush core with clean acetone or aliphatic
R naphtha, when contaminated by oil or other lubricants.

R (4) Dry core by air drying at ambient temperature for a
R minimum of one hour until no trace of solvent remains.

R NOTE: Vapor degrease only on core without face sheets
R bonded to it.

R NOTE: Flushing of core with trichloroethylene or
R perchloroethylene liquid is acceptable.

12. Method IX

A. Non-metallic, Except Paper-honeycomb Core Preparation

(1) Examine honeycomb core for contamination.

(2) Remove dry contamination by carefully blowing clean dry compressed air over surface.

WARNING: USE SOLVENT IN WELL-VENTILATED AREA. DO NOT INHALE VAPOR AND AVOID FLUID CONTACT WITH SKIN AND EYES. PROLONGED EXPOSURE MAY RESULT IN NAUSEA OR SKIN OR EYE IRRITATION. KEEP SOLVENT AWAY FROM HEAT, SPARKS AND OPEN FLAME. FAILURE TO COMPLY MAY RESULT IN MATERIAL COMBUSTION.

(3) Spray or flush core with clean acetone or aliphatic naphtha, when contaminated by oil or other lubricants.

(4) Dry core by air drying at ambient temperature until no trace of solvent remains.

NOTE: Vapor degrease with trichloroethylene or perchloroethylene.

R 13. Method X

R A. Honeycomb core (Paper)

R (1) Dry contamination shall be removed by carefully blowing
R clear dry compressed air over the surface.

R (2) When contaminated by oil or other lubricants, the core
R shall be rejected.

14. Method XI

A. Non-metallic Detail Parts Preparation (Faying Surfaces) Except Core

CAUTION: AVOID CUTTING THROUGH OR BREAKING WOVEN REINFORCEMENTS.

(1) Lightly abrade with 240 grit or finer abrasive material to remove surface gloss or shine.

WARNING: USE SOLVENT IN WELL-VENTILATED AREA. DO NOT INHALE VAPOR AND AVOID FLUID CONTACT WITH SKIN AND EYES. PROLONGED EXPOSURE MAY RESULT IN NAUSEA OR SKIN OR EYE IRRITATION.

WARNING: KEEP SOLVENT AWAY FROM HEAT, SPARKS AND OPEN FLAME. FAILURE TO COMPLY MAY RESULT IN MATERIAL COMBUSTION.

(2) Wipe thoroughly all faying surfaces with a clean cloth moistened with aliphatic naphtha.

(3) Wipe parts dry with a dry clean cloth.

CAUTION: DO NOT EXPOSE FIBERS WHEN USING ABRADING PROCESS.

(4) Use abrading process on reinforced plastics.

(5) Clean and remove all grit residue by wiping with clean cloths dampened with methyl-ethyl-ketone or aliphatic naphtha or applicable adhesive primer solvent.

(6) Wipe parts dry with clean cloths immediately prior to bonding.

NOTE: Omit abrading on primed surfaces which have been protected by being in contact with a peel ply fabric during preceding bond stages.

15. Method XII

A. Steel Alloys-hand Cleaning Parts for Preparation

WARNING: USE SOLVENT IN WELL-VENTILATED AREA. DO NOT INHALE VAPOR AND AVOID FLUID CONTACT WITH SKIN AND EYES. PROLONGED EXPOSURE MAY RESULT IN NAUSEA OR SKIN OR EYE IRRITATION.

WARNING: KEEP SOLVENT AWAY FROM HEAT, SPARKS AND OPEN FLAME. FAILURE TO COMPLY MAY RESULT IN MATERIAL COMBUSTION.

(1) Hand wipe parts with a clean cloth saturated with methyl-ethyl-ketone, acetone, toluene or aliphatic naphtha.

(2) Mask areas previously bonded in such a manner as to prevent damage to bond area.

WARNING: USE HYDROCHLORIC ACID PASTE IN WELL-VENTILATED AREA. DO NOT INHALE VAPOR AND AVOID MATERIAL CONTACT WITH SKIN OR EYES. PROLONGED EXPOSURE MAY RESULT IN RESPIRATORY SYSTEM OR SKIN OR EYE IRRITATION.

(3) Brush areas to be bonded with a liberal coating of hydrochloric and paste.

NOTE: Hydrochloric acid paste consist of one part by volume of clean water, one part by volume of hyrochloric acid and one ounce by weight of Cab-O-Sil or Santocel for each 8.5 fluid ounces of solution.

(4) Agitate coating continuously for 15 to 20 minutes applying additional paste as necessary to keep surface completely covered with wet paste.

NOTE: Use alternate paste Pasa-Jell 105 commercially packaged acid paste in lieu of hydrochloric acid paste if applicable.

(5) Remove paste by wiping from area with clean paper towels and wipe from center to edge with fresh paper for each stroke.

(6) Remove masking prior to rinsing of part.

(7) Flush coated areas with clean water until all acid paste is removed and areas checked for water-break.

NOTE: Verify acid removal by use of indicator paper.

16. Method XIII

A. Preparation of Titanium for Bonding

WARNING: USE SOLVENT IN WELL-VENTILATED AREA. DO NOT INHALE VAPOR AND AVOID FLUID CONTACT WITH SKIN AND EYES. PROLONGED EXPOSURE MAY RESULT IN NAUSEA OR SKIN OR EYE IRRITATION.

WARNING: KEEP SOLVENT AWAY FROM HEAT, SPARKS AND OPEN FLAME. FAILURE TO COMPLY MAY RESULT IN MATERIAL COMBUSTION.

(1) Clean areas to be bonded by hand, using clean cloth saturated with aliphatic naphtha or aromatic thinner, naphtha.

(2) Mask areas previously bonded in such a manner as to prevent damage to bonded area.

(3) Brush area to be bonded with liberal coating of Pasa-Jell 107, cleaning and passivating compound.

NOTE: Agitate coating frequently for 15 to 20 minutes.

(4) Remove cleaning and passivating compound by wiping from area using clean paper towels and wipe from center to edge with fresh paper for each stroke.

(5) Remove masking prior to rinsing part.

(6) Flush, rinse coated area thoroughly with clean water until all cleaning and passivating compound is removed and are check for water-break.

17. Method XIV

A. Polyglycol Rigidized Aluminum Honeycomb Preparation

(1) Heat parts in an oven heated 225 to 300 degrees F or 106.7 to 148.9 degrees C until all polyglycol is removed.

(2) Rinse parts in 160 to 200 degrees F or 71.1 to 93.3 degrees C water for a minimum of two minutes. Followed by a 50 to 150 degree or 10.0 to 65.6 degree C clean water spray rinse for a minimum of three minutes.

(3) Force dry parts in a circulating-air oven, maintained at 150 degrees F or 65.6 degrees C maximum until dry.

NOTE: Control air in oven to preclude contamination of cleaned parts.

MARKING AND IDENTIFICATION OF PARTS, ASSEMBLIES, AND AIRCRAFT - LCP82-1016A

1. SCOPE

1.1 This specification establishes requirements for the marking and identification of Lockheed-designed parts, assemblies, and aircraft. It supplements the requirements of the Engineering drawings and model finish specifications, but does not apply to purchased equipment or accessories, nor to government furnished equipment, except as specifically prescribed on the applicable drawings or specifications.

2. APPLICABLE DOCUMENTS

2.1 SPECIFICATIONS

Federal

O-T-236	Perchloroethylene
O-T-634	Trichloroethylene, Technical
TT-M-261	Methyl-Ethyl-Ketone (for Use in Organic Coatings)

Military

MIL-L-3150	Lubricating Oil, Preservative, Medium
MIL-C-16173	Corrosion Preventive Compound, Solvent Cut Back, Cold Application
MIL-P-19834	Plates, Identification, Metal Foil Adhesive Backed
MIL-T-81533	Trichloroethane 1,1,1, Stabilized

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2.1 (continued)

Lockheed

LCM37-1143	Ink, Marking
LCP78-2051	Stencil Enamel, Polyurethane, (LCM37-2092), Application of

STANDARDS

Military

MS27253	Plate, Identification

Lockheed

LS 1401	Plate, Identification, Assembly
LS 2477	Plate, Identification, Commercial Aircraft
LS 9012	Plate, Identification, Military Aircraft
LS 10640	Plate, Identification, Weight and Balance

2.2 The following commercial materials, covered by the Lockheed Corporate Engineering Purchasing Specification (CEPS) Manual, form a part of this specification to the extent specified herein:

Material	CEPS Number
Felt Marking Pens (For Titanium)	L 37.5610
Ink Pencil (For Titanium)	L 37.5615
Ink, Marking For Titanium	L 37.5620
Conditioner, Ink (For Use With L 37.5620)	L 37.5621
Ink, Marking, Heat, Green	L 37.5650
Ink, Marking, White General Purpose	L 37.5622
Ink, Temporary Type	L 37.5624

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2.2 (continued)

Material	CEPS Number
Ink, Marking, Black	L 37.5626
Thinner, Marking Ink, Black (For Use With L 37.5626)	L 37.5628
Ink, Etching (For Aluminum)	L 37.5630
Electrolyte, Chemical Etching (For Use On Titanium)	L 31.2970
Neutralizer and Cleaner (For Use With L 31.2970)	L 31.2971
Layout Dye (For Use On Titanium)	L 31.2360
Protective Coating for Sealant	L 37.4598

3. REQUIREMENTS

3.1 General

3.1.1 Permanent identification locations. - If the permanent identification location is not called out on the drawing, or in the specification, the identification shall be located in such a manner that it will be visible after installation of the part or assembly, if practicable.

3.1.2 Legibility. - This shall be such as required for ready readability and identification of the part or assembly.

3.1.3 Permanent identification of parts and assemblies. - Each part and assembly shall be permanently identified with the same number as the drawing number, including the applicable dash number, except as follows:

(a) Parts or assemblies that do not have a suitable nor sufficient surface for a part number.

(b) Parts or assemblies that are permanently assembled by welding, brazing, soldering, or riveting. These parts or assemblies shall carry their assembly part number.

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3.1.3.1 Parts and assemblies. - Each part and assembly (as defined in 6.1.1), except those that do not have a suitable or sufficient surface, shall be permanently and legibly marked with the identification number, the design activity code identification number, and the manufacturer's code identification number when it is different from the design activity code identification number.

3.1.3.2 Spare parts. - Spare parts shall be identified in accordance with 3.1.3 prior to delivery to the customer.

3.1.3.3 Add the letters "ASSY" immediately adjacent to the assembly part numbers, except that this requirement is not applicable to MS27253 or LS 1401 markings.

3.1.3.4 Special parts and assemblies shall be identified with the identifying number, and the letters SPL. These letters shall not form a part of the identifying number.

3.1.3.5 Altered parts. - When an item is altered, the old identification shall be removed or "Xed" out and, when space permits, the item shall be identified.

3.1.4 Permanent identification of units and sets. - Units and sets shall be permanently identified with the following information: nomenclature, identifying number, special characteristics and stock number unless specifically exempted, design activity's identification, and the contract or order number.

3.1.4.1 When specified, units and sets shall also be permanently identified with the following additional information: specification data, serial number, date of acceptance, length of warranty, data of manufacture, registration number, weight, cure and manufacturer's identification.

3.1.5 Permanent identification of interchangeable, replaceable, category, and equipment items.

3.1.5.1 Interchangeable, replaceable, and equipment items shall carry the part number including the applicable dash number.

3.1.5.2 Completed units which are noted as interchangeable, replaceable, or category on the Engineering drawing shall be so identified when required by the contract.

3.1.6 Unsuitable locations and surfaces. - Surfaces shall not be marked in a location or by a method which will ultimately impair the function of the part or assembly (e.g., no marking shall be permitted on polished, moving bearings or close-tolerance surfaces).

3.1.7 Color and style. - If not specified by the Engineering drawings or specifications, the color shall be selected to provide maximum contrast with the background, and the style shall be in accordance with standard commercial styles.

3.2 Detail marking methods

3.2.1 Temporary identification. - Temporary identification, such as removable ink markings, tagging, or markings on the container or the accompanying paper, may be used to facilitate fabrication and assembly, or whenever further processing makes it impracticable to mark permanently.

3.2.1.1 Ink markings are considered temporary if they can be removed with a non-marring solvent such as O-T-634, Type II Trichloroethylene, O-T-236 Perchlorethylene, MIL-T-81533 Stabilized 1,1,1, Trichloroethane, or water.

3.2.1.2 Titanium parts and assemblies. - Chlorinated solvents or materials containing chlorinated solvents shall not be used. Grease pencils shall not be used. However, inadvertent grease pencil marks shall be removed with alcohol or TT-M-261 Methyl-Ethyl-Ketone. Only those items specified in 3.2.1.2.1, 3.2.1.2.2, and 3.2.1.2.3 shall be used for the temporary marking of titanium parts and assemblies.

3.2.1.2.1 Felt marking pens. - Felt marking pens (CEPS L37.5610) may be used to temporarily mark titanium. Removal shall be accomplished using alcohol, TT-M-261 Methyl-Ethyl-Ketone, or hot soapy water.

3.2.1.2.2 Ink pencils. - Ink pencils (CEPS L37.5615) may be used to temporarily mark titanium. Removal shall be accomplished by wiping with a damp cloth or the equivalent.

3.2.1.2.3 Layout dye. - Layout dyes (CEPS L31.2360) may be used to temporarily mark titanium. Removal shall be accomplished using alcohol or TT-M-261 Methyl-Ethyl-Ketone.

3.2.2 Permanent identification. - If a specific method is not required by Lockheed Engineering, Lockheed Engineering drawings, or Lockheed Specifications, required markings shall be applied in accordance with one of the following methods, as specified herein.

3.2.2.1 On detail parts, the markings shall be applied preferably before application of the protective finish. In cases where the protective finish obliterates the markings, the marking shall be replaced using the original method, and the protective finish reapplied in accordance with the applicable Engineering Process Bulletin for touch-up.

3.2.2.2 Impression stamping. - Impression stamping shall not be permitted on the following:

(a) Titanium parts

(b) Ferrous parts having a tensile strength of 180,000 psi or over, or which are to be heat treated to a tensile strength of 180,000 psi or over, except: (1) when stamping is restricted to the heads or ends of bolts or pins; (2) when the Engineering drawing specifically indicates a location for impression stamping; (3) when a welder's marking is placed in the weld bead and only to the minimum depth required for legibility.

(c) Castings or forgings, except where a raised boss is provided for identification.

(d) Aluminum alloy and magnesium alloy sheet, 0.025 inch thick, and under, and tubing used for plumbing, except identification tags and nameplates.

(e) Sections or areas of a part or assembly which form a part of the exterior surface of the airplane, or where operation or flight conditions cause chafing or rubbing.

(f) Swaged portions of control cable fitting.

(g) Fillet radii of machined parts and extrusions, or surfaces immediately adjacent to edges. The edge of the impression stamp from a fillet radius tangency line or bend tangency line shall not be less than 1/4 of the fillet or bend radius, but no less than 0.03 inch. The edge of the stamp shall not be less than one half of the part thickness from the edge of the part, but not less than 0.03 inch.

(h) Areas where holes exist or will later be punched or drilled. The minimum distance of the impression stamp from a hole edge shall be as follows (this does not apply to holes in fatigue critical joints nor to lightening holes and cutouts):

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3.2.2.2(h) (continued)

(1) 0.12 inch, if the impression stamp is between 1-1/2 and 2 inches from the part end.

(2) 0.06 inch, if the impression stamp is within 1-1/2 inches of the part end.

(3) One hole diameter at all other locations other than those listed in (1) and (2).

(i) Bearing surfaces, or other smooth machined surfaces having an RHR designation of 63 micro-inches or better.

(j) Heat or air ducts fabricated from metallic materials.

(k) Integrally stiffened fuselage deck and bulkhead webs and stiffeners.

(l) The edge surface of any part. For parts with a tapered flange, the impression stamp shall be on the tapered flange surface.

(m) On the outside of formed parts or extrusions. The stamp shall be on the inside surface.

3.2.2.2.1 Hand impression stamping of 2014, 7075, 7079, or 7178 alloys shall not be permitted. Impression stamping by means of pneumatic stamping machines, such as the Heidrich Nourse Air Operated Impact Press, Models 150 - VS, 200 - VS, or 3-VS; or by devices applying uniform pressure over the characters; is permissible.

3. 3.2.2.2.2 Steel stamps. - Steel stamps shall consist of numeral 1/16 to 3/16 inch high, and shall have all sharp corners rounded to a radius of 0.005 plus 0.005 minus 0.000 inch for the 1/16 to 1/8 inch size markings, and a radius of 0.010 plus 0.005 minus 0.000 inch for the 3/16 inch markings. Color fill is not required.

3.2.2.2.3 Depth of impression. - This shall be no greater than is necessary to obtain reasonable legibility, and shall not exceed 0.010 inch.

3.2.2.2.4 Disfigurement. - There shall not be detrimental distortion or flattened areas of any surface.

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3.2.2.3 Electric etched markings. - Etchings by means of an electric needle may be used only when specified on the Engineering drawing subject to the restrictions of 3.2.2.2.4.

3.2.2.4 Electrochemical etched markings may be used where not prohibited by the Engineering drawing and subject to the restrictions of paragraphs 3.2.2.2 except item (d), and with the exception that titanium fail-safe straps shall be marked in accordance with paragraph 3.2.2.4.2.

3.2.2.4.1 These require the use of special equipment manufactured by Lectroetch Company, Cleveland, Ohio, or the equivalent.

3.2.2.4.2 Electro-chemical etching of titanium parts in applications above 450° shall be accomplished with chemical etching electrolyte (CEPS L31.2970) and neutralizer-cleaner (CEPS L31.2971). Identification of fuselage skin fail-safe titanium straps shall be by electro-chemical etching, using deep electro-chemical etchant (CEPS L31.2970). Identification shall not be made within one inch of any edge of a strap, or in an area where holes will be made for attaching stringers or splicing straps, whenever possible. Identification shall be made as far as possible from the previously mentioned areas, where the one inch clearance cannot be maintained.

3.2.2.4.3 Depth of impression. - This shall be no greater than is necessary to obtain reasonable legibility and shall not exceed 0.003 inch.

3.2.2.4.4. Immediately after marking by the electro-chemical etching method, all excess marking fluid shall be removed, and a coat of MIL-C-16173 Corrosion Preventive Compound or MIL-L-3150 Preservative Oil applied to the marked area.

3.2.2.5 Electric vibrating pencil markings

3.2.2.5.1 Electric vibrating pencil markings require the use of special equipment manufactured by Ideal Industries Inc., No. 11-100 or the equivalent.

3.2.2.5.2 Only when specified on the Engineering drawing shall this method be used; and if this method is used on alloy steel parts heat treated 180 ksi, UTS and above, the protruded metal caused by the electric vibrating pencil shall be removed.

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3.2.2.5.3 The tool shall be held in an approximately vertical position during use, and shall not exceed 20 degrees from the vertical position.

3.2.2.5.4 For alloy steel parts, this method is subject to the restrictions specified in 3.2.2.2.3 and 3.2.2.2.4.

3.2.2.5.5 On aluminum sheet, forgings, and castings, the maximum depth of penetration shall not exceed 0.003 inch. On aluminum, the minimum thickness to be marked shall be not less than 0.040 inch.

3.2.2.6 Pneumatic vibrating pencil markings

3.2.2.6.1 These require the use of special equipment manufactured by Chicago Pneumatic Company, Model CP61 Air Scribe with a "D" type stylus or the equivalent.

3.2.2.6.2 The stylus shall have a tool radius of 1/64 to 1/32 inches.

3.2.2.6.3 Only when specified on the Engineering drawing shall this method be used; and if this method is used on parts heat treated 180 ksi UTS and above, the protruded metal caused by the pneumatic pencil shall be removed.

3.2.2.6.4 This method is subject to the restrictions of 3.2.2.2.4.

3.2.2.6.5 The tool shall be held in an approximately vertical position during use, and shall not exceed 20 degrees from the vertical position.

3.2.2.6.6 Depth of impression. - This shall be no greater than necessary to obtain reasonable legibility, and shall be 0.006 inch maximum.

3.2.2.6.6.1 On landing gear parts, the depth of impression shall be 0.004 to 0.010 after removal of protruding metal. The markings shall be located only in the area specified by the Engineering drawing.

3.2.2.7 Rubber stamping

3.2.2.7.1 Inks used for rubber stamping shall conform to Table I.

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TABLE I - RUBBER STAMP INKS

Material to be Marked	Ink Numbers	Material to be Marked	Ink Numbers
Acrylic Plastic	1,3,7	Nickel Plate	1,2,5,6,7,8
Aluminum - Unpainted	1,4,5,6,8 See 3.2.2.7.2	Paper	1,2,3,5,6,7, 8
Aluminum - Primed or Painted	1,3,5,6,7,8	Phenolic	1,2,5,6,7,8
		Polycarbonate Plastic	1,3,7
Cadmium Plate	1,3,5,6,7,8	Polyester Windows	1,2,6,7,8
Chromium Plate	1,5,6,8	Steel	1,2,3,6,8
Cork	1,2,6,7,8	Synthetic Rubber	1,2,6,7,8
Fabric	1,2,6,7,8	Titanium	1,6,8 See 3.2.2.7.3
Fiberglass	1,2,3,5,6,7, 8	Wood	1,2,6,7,8
Leather	1,2,6,7,8	Zinc Plate	1,2,5,6,8
Magnesium (finished)	1,3,6,8		
Mylar (polyester)	1,2,5,6,7,8		
Natural rubber	1,2,6,8	All other materials	1

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3.2.2.7.1 (continued)

Ink Numbers:

1. LCM37-1143
2. White Marking Ink (CEPS L37.5622)
3. Black marking ink (CEPS L37.5626):
4. Etching ink for aluminum (CEPS L37.5630): Cannot be removed. The restrictions of 3.2.2.7.6, 3.2.2.7.6.1, 3.2.2.4.4, and 3.2.2.4.5. apply to the usage of this ink.
5. Temporary type ink (CEPS L37.5624): vapor degrease will remove.
6. Black marking ink (CEPS L37.5620): thin with ink conditioner (CEPS L37.5621)
7. Heat treat green ink (CEPS L37.5650)
8. White marking ink (CEPS L37.5620): thin with ink conditioner (CEPS L37.5621)

3.2.2.7.2 Inks numbers 6 and 8 may be used on unpainted aluminum provided that no further processing of the surface is necessary, such as anodizing, which will remove the identification marking.

3.2.2.7.3 The removal of markings on titanium shall be accomplished with alcohol or TT-M-261 Methyl-Ethyl-Ketone. Chlorinated solvents shall not be used.

3.2.2.7.4 Characters shall be 1/6 to 1/2 inch high where possible and may be used on large sheets, long stringers, and other parts and assemblies where impression markings are difficult to find.

3.2.2.7.5 Acid-etch ink marking. - Acid-etch ink marks are approved for identification of parts or assemblies which do not form a part of the exterior of the aircraft.

3.2.2.7.5.1 Acid-etch ink markings shall not be applied to moving, bearing surfaces, or smooth machined surfaces having an RHR designation of 63 micro-inches or better.

3.2.2.7.6 Where ink marking is required on tubing, fittings, or components to be installed on aircraft using fire resistant hydraulic fluid, #3 ink (CEPS L37.5626), #6 or #8 ink (CEPS L37.5620) shall be used and overcoated with protective coating (CEPS L37.4598). The coating shall be applied to a thickness of 0.0005 to 0.001 inch and shall extend more than 1/4 inch past the edges of the marking.

3.2.2.7.7 Where ink marking is required for electrical reference designations, #3 ink (CEPS L37.5626), #6 or #8 ink (CEPS L37.5620) shall be used and overcoated with protective coating (CEPS L37.4598). The coating shall be applied to a thickness of 0.0005 to 0.0010 inch and shall extend more than 1/4 inch past the edges of the marking.

3.2.2.8 Tagging. - Those parts or assemblies which cannot be marked because of further processing, size, composition, or dielectric properties, such as teflon, helical springs, etc., may be tagged with a tag, and wire or string material, compatible with the material of the parts or assemblies.

3.2.2.8.1 A minimum of 10 percent of parts or assemblies in this category shall be tagged as specified above, unless the parts or assemblies are in a sealed container, in which case a minimum of two percent or two parts, whichever is greater, shall be tagged.

3.2.2.9 Container marking. - When tagging for identification of parts or assemblies is impractical because of size, composition, configuration, dielectric properties, etc., they may be placed in a bag, container, box, envelope, or package with rubber stamping on exterior surfaces or attached tag to identify the parts or assemblies therein.

3.2.2.10 Other marking methods. - Other acceptable methods include stencilling, in accordance with LCP78-2051, silk screening, or the application of decalcomanias or metal wrap-around tags.

3.3 Specific marking requirements

3.3.1 Magnesium parts and assemblies. These shall be identified with the notation "MAG", along with the identification number.

3.3.2 Side windows. - On military aircraft, when a specific marking method is not required by the Engineering drawing or fabrication specification, side windows in the cockpit area shall be identified using MIL-P-19834, Type I, Identification Plates.

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3.3.3 Removable panel identification. - Exterior inspection panels, plates, or access doors shall be marked as specified on the Engineering drawing, and shall be identified by the regularly assigned aircraft station number applicable to the panel in permanent position.

3.3.3.1 Station identification markings shall not interfere with the regularly assigned identification number.

3.3.4 Aircraft nameplates. - The required information shall be applied to the nameplate by impression stamping in accordance with 3.2.2.2.

3.3.4.1 Aircraft identification plate. - LS 9012 and LS 2477 plates, for military and commercial aircraft respectively, shall contain the following information:

(a) Manufactures model designation

(b) Customers model designation

(c) Manufacturers serial number

(d) Customers serial number

(e) Contract number (applicable to U.S. Air Force only)

(f) Type certificate (commercial models only)

(g) Engine type

(h) Acceptance date

(i) Manufacturer aircraft association number (commercial models only)

3.3.4.2 Commercial aircraft assemblies and military aircraft subassemblies. - LS 1401 plates shall contain the following information:

(a) Serial number (see 3.3.4.3)

(b) Assembly number

(c) Date of manufacture

(d) Inspectors identification number

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3.3.4.3 Commercial aircraft and military aircraft assemblies. - LS 10640 plates shall show the following information:

(a) Serial number

(b) Assembly number

(c) Manufactured weight

(d) Maximum weight

(e) Unbalance

(f) Maximum unbalance

(g) Date manufactured

(h) Inspector

3.3.4.4 Serial numbers for commercial aircraft assemblies and military aircraft subassemblies (unless otherwise specified by Lockheed internal control documentation). - The serial number shall be composed of:

(a) One or two letters indicating the contractor, sub-contractor, or vendor (Lockheed California shall always be "A")

(b) Four numbers indicating the order of manufacture of the component (See 3.3.6.4.1.1).

Examples:

Serial No. DD0001 indicates the first unit, manufactured by Smith Manufacturing Co.

Serial No. A 0859 indicates the 859th unit, manufactured by Lockheed California

Serial No. Y 0074 indicates the 74th unit, manufactured by the Jones Corporation.

3.3.4.5 MS 27253 plate marking details. - Marking of MS 27253 Identification and Modification Plates shall be as specified herein. It is mandatory that the information recorded be accurate in every detail. The following information shall be provided by Lockheed and sub-contractor(s) on major structural assemblies for military aircraft:

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3.3.4.5 (continued)

(a) Aircraft model - Military service model designation

(b) Manufacturer's code - Code identification (Example: 36659 for Lockheed-California Co.)

(c) Part number - Assembly part number

(d) Contract number - Applicable to U. S. Air Force only

(e) Serial number - Assembly unit serial number in accordance with 3.3.4.4.1

(f) Company inspector - Contractor inspector's identification

(g) Customer inspector - Government inspector's identification (Applicable to U.S. Army only)

(h) Aircraft service changes - Stamp the heading "A.S.C." on the line directly below "Modifications Incorporated", and record the "Numbers" of the changes incorporated in the assembly by Lockheed prior to delivery.

3.3.4.5.1 Assembly unit serial numbers (unless otherwise specified by Lockheed internal control documentation). - In order that identification of changes may be accomplished to the fullest extent, Lockheed shall establish a code system for identification of all applicable units, by the serial number of the assembly rather than by the aircraft serial number.

3.3.4.5.1.1 All applicable assembly units of the same type manufactured by Lockheed shall be numbered consecutively, starting with number 1, to indicate the numerical order of the unit manufactured by Lockheed and the respective sub-contractors. The numerical sequence shall continue as long as a given basic drawing numbered assembly is manufactured, regardless of any dash number changes. If the basic drawing number of an assembly is changed, the units manufactured under the new basic drawing number shall be consecutively numbered starting with number 1. Symmetrically opposite assemblies of a set shall be assigned the same serial number, as these assemblies will be further identified by the part numbers on the identification and modification plates.

3.3.5 Radio call numbers (unless otherwise specified on the Engineering drawing).

3.3.5.1 The radio call number shall be applied in the location as prescribed on the Engineering drawing.

3.3.5.2 The identification marking shall consist of not less than 5 numerals.

3.3.5.3 Identification numbers shall be derived from the aircraft serial number.

3.3.5.4 Arabic numbers shall be used when applying call numbers.

3.3.5.5 The first numeral of the contract year and the hyphen in the aircraft serial number shall not be used in the identification number.

3.3.5.6 If 5 numerals are not available in the aircraft serial number from which to derive 5 numerals for the identification marking, zeros shall be used to produce 5 numerals.

3.3.5.7 Should more than 5 numerals be available, the last 5 numerals of the aircraft serial number shall be used.

3.3.5.8 Since numbers once assigned may reach an age of 10 years or more, there is a possibility that two sets of radio call numbers could be identical.

3.3.5.9 To prevent this, the symbol "0-" shall precede derived numbers of more than 10 years of age.

Examples:

(a) For serial number 59-5434 use 95434

(b) For serial number 59-653472 use 53472

(c) For serial number 59-7 use 90007

(d) For serial number 60-7 use 00007

(e) For serial number 50-7 use 0-0007

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3.3.6 Identification of paint shop and applied finish (unless otherwise specified by the Engineering document). - Aircraft receiving paint finish on the entire exterior surface or a major portion thereof shall be marked to identify the paint shop and the finish applied.

3.3.6.1 The contractor performing the work shall apply the markings by means of a patch or decal from 2-1/2 to 4 inches in diameter, or by stencilling within a black circle 4 inches outside diameter and 3-3/4 inches inside diameter.

3.3.6.2 The marking shall be located on the starboard side of the fuselage, under the horizontal stabilizer.

3.3.6.3 The markings shall record the following information:

(a) Contractor and location

(b) Date of completion of paint application (month, day, year)

(c) Identification by specification number of every coating of the general system applied to the exterior of the aircraft.

3.3.6.4 Item "c" may be stencilled on the fuselage immediately below, or alongside the patch, decal or stencilled circle which contains items "a" and "b".

Example:

LO - Burbank
12-12-67
MIL-C-8514 - 1 coat
MIL-P-8585 - 1 coat
TT-L-20-2 coats

Indicates that:

Contractor (Lockheed whose code letters are LO on 12-12-67 applied 1 coat of MIL-C-8514 Pretreatment Coating (Wash Primer); 1 coat of MIL-P-8585 Zinc Chromate Low Moisture Sensitivity Primer; and 2 coats of TT-L-20 Lusterless lacquer.

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3.3.6.5 When non-Government specification paint is used on the exterior surfaces of aircraft, identification of the material, the manufacturer's name, and the number of coats shall be listed.

Example:

LO - Burbank
12-12-67
MIL-C-8514 - 1 coat
Epoxy Enamel (Magna Coatings and Chemical Corp.)
#3-W-57 - 2 coats #3-X-69 - 2 coats

4. QUALITY ASSURANCE

4.1 Adequate surveillance of the requirements of this specification must be maintained to insure compliance.

4.2 Inspector's stamp. - This shall consist of impression stamping in accordance with 3.2.2.2, or rubber stamping in accordance with 3.2.2.7, placed in the space provided on nameplates; and whenever practicable, immediately adjacent to the part or assembly number on parts or assemblies without nameplates.

5. HANDLING AND TRANSPORTATION

5.1 Parts shall be handled and transported in such manner as will ensure that the required physical characteristics and properties are preserved.

6. NOTES

6.1 Definitions

6.1.1 Parts and assemblies. - Parts and assemblies which require code identification are: spare parts, regulated assemblies, procurement controlled (vendor designed and built) parts, and the finished aircraft.

6.1.2 Special parts and assemblies. - These resemble commercial or standard parts or assemblies.

6.2 The requirements of this specification meet or exceed, but will not replace, the requirements of Lockheed California Company Process Specification C-0227A, dated April 16, 1968; and Lockheed Georgia Company Process Specification STP63-001, Rev. 3, SRN No. 3, dated April 20, 1968.

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6.3 The requirements of this specification meet or exceed the applicable requirements of MIL-M-25047C, MIL-I-18464F (2), MIL-F-18264D, MIL-STD-130C, and MIL-C-18263E(1) except as specified herein.

SAFETYING- MAINTENANCE PRACTICES

1. General

This procedure establishes the methods and materials for safetying of miscellaneous aircraft hardware.

2. Equipment and Materials

Compound, Sealing, MIL-S-8802 Type B; or equivalent

NOTE: Refer to Table 201 for cotter pin and safety wire material.

3. Safety Wiring, Single Wire Method

A. Maintenance Practices (Ref. Fig. 201)

NOTE: Single wire method may be used in a closely spaced closed geometrical pattern (triangle, square, rectangle, circle etc.), on parts in electrical systems, and in places extremely difficult to reach.

MATERIAL	SPECIFICATION	COLOR	APPLICATION	SIZE, INCHES			
				COTTER PIN OR SINGLE WIRE	DOUBLE TWIST WIRE DIA	DOUBLE TWIST HOLE DIA	FASTENER SPACING
CRES COTTER PIN	MS24665	NATURAL	ALL TO 800° F	LARGEST TO FIT HOLE	--	--	--
1020 CARBON STEEL	QQ-W-461		ALL TO 450° F				
INCONEL WIRE	QQ-W-390 COND. A	NATURAL	ALL EXCEPT AS NOTED BELOW		.020	LESS THAN .045	UP TO 6.00
5056 ALCLAD ALUMINUM LOCK-WIRE, ANODIZED AND DYED BLUE	COMMERCIAL	BLUE 15102 OR 25102	MAGNESIUM		.020	.045-.062	LESS THAN 2.00
					.032	.045 AND OVER	UP TO 6.00
COPPER WIRE, CAD PLATED AND DYED YELLOW	QQ-Q-343 TYPE S (MS20995)	YELLOW 13655 OR 23655	SHEAR-ELECTRICAL CONNECTORS	.020	--	--	--

M1-0002-20-541

R R R Cotter Pin and Safety Wire Material Size, Application and Spacing Table 201

CAUTION: USE NEW SAFETY WIRE UPON EACH NEW APPLICATION.

(1) Select necessary materials listed on Table 201.

(2) Safety wire parts so that wire is put in tension when part tends to loosen.

(3) Make pigtail of one-fourth to one-half inch (three to six twists) at end of wiring.

CAUTION: IN ALL CASES WHERE LOCKWIRE IS USED IN FUEL TANKS, FOLD FREE END BACK AGAINST PART BEING SAFETIED SO NO SHARP ENDS PROTRUDE.

(4) Bend pigtail back or under to prevent it from becoming a snag.

B. Safetying of NAS 509 Nuts

(1) With NAS 513 and similar type washers (Ref. Fig. 202).

CAUTION: TANG PORTION OF THESE WASHERS MUST BE ENGAGED IN FACE SLOT OF ROD AFTER ASSEMBLY OF PARTS.

(a) Follow safety wiring procedures as outlined in Paragraph 3.A. and Figure 202.

(2) With NAS 1193( )-1, NAS 1193( )-2 and similar type locking devices (Ref. Fig. 202).

CAUTION: TANGS ON BACK OF NAS 1193( )-1 AND SIMILAR TYPE LOCKING DEVICES MUST BE ENGAGED IN FACE SLOTS OF ROD AFTER ASSEMBLY. SERRATED FACES OF THE TWO HALVES MUST FACE EACH OTHER.

(a) Follow safety wiring procedures as outlined in Paragraph 3.A. and Figure 202.

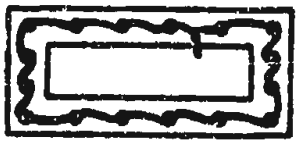
(3) With NAS 559 and similar type locking devices (Ref. Fig. 202).

(a) Follow safety wiring procedures as outlined in Paragraph 3.A. and Figure 202.

C. Safetying of Quick Disconnect Pin (Ref. Fig. 203)

(1) Follow safety wiring procedures as outlined in Paragraph 3.A. and Figure 203.

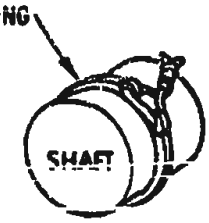
(2) Pass wire through hollow center of pin and around both sides of retaining clip.



SINGLE-WIRE METHOD
SMALL SCREWS IN CLOSELY SPACED, CLOSED GEOMETRICAL PATTERN.

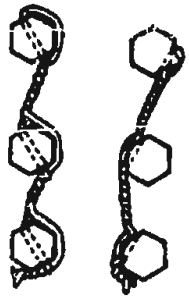
DOUBLE-TWIST METHOD
SINGLE FASTENER APPLICATION.

HIGH TENSILE BOLT HEADS.
WIRE MAY GO OVER TOP OF BOLT HEAD OR THROUGH CAVITY.



SINGLE-WIRE METHOD
EXTERNAL SNAP RING.

DOUBLE-TWIST METHOD
CASTELLATED NUTS
ON STUDS.



DOUBLE-TWIST
METHOD
MULTIPLE FASTENER
APPLICATION.

TRI-WING SCREWS.
OPTIONAL METHODS -
THRU ONE HOLE AND
OVER TOP OR THRU
2 HOLES AND AROUND

NOTE

1 ILLUSTRATIONS ARE TYPICAL OF CORRECT SAFETY-WIRE APPLICATIONS FOR RIGHT HAND THREADS. SAFETYING FOR LEFT HAND THREADS IS OPPOSITE.

M1-0002-20-545

R
R

Typical Safety Wiring Applications
Figure 201

4. Safety Wiring, Double Twist Method

A. Maintenance Practices (Ref. Fig. 201)

NOTE: Double twist type safety wiring is the preferred method, whenever possible.

CAUTION: USE NEW SAFETY WIRE UPON EACH NEW APPLICATION.

(1) Select necessary materials listed on Table 201.

(2) Limit tie points to a maximum of six inches.

NOTE: Intermediate tie points may be used to keep safety wire span below six inches.

(3) Limit length of safety wire to 24 inches.

(4) Safety wire in sets of two except where an uneven number is encountered, in which case, limit multiple fastener safetying to groups of three.

CAUTION: TWISTS SHOULD BE TIGHT AND EVEN AND WIRE BETWEEN TIE POINTS AS TAUT AS POSSIBLE WITHOUT OVERSTRESSING.

(5) Twist, where practical, so that on first twist the wire passing through hole will pass over wire passing around head of fastener.

(6) Twist snug, with recommended number of twist being one half to three full twist per inch.

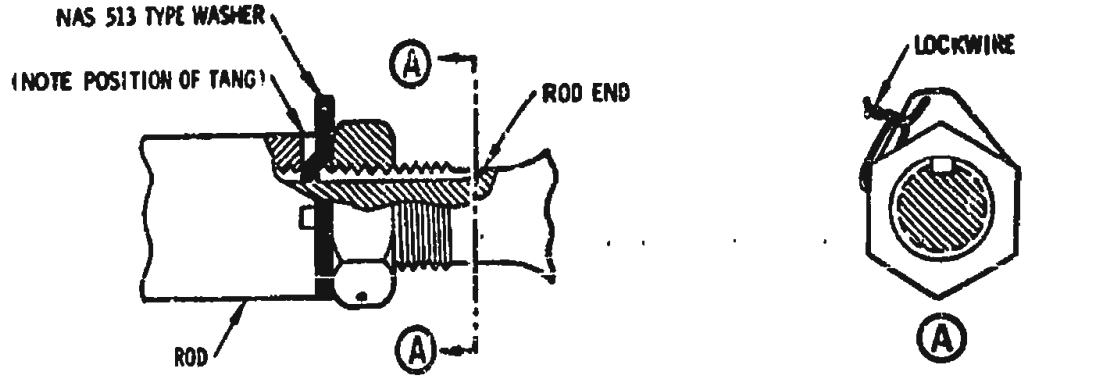
NOTE: A minimum of one full twist between holes is required.

Saftey wire should always be installed and twisted so that loop around head stays down and does not tend to come up over bolthead, causing a slack loop.

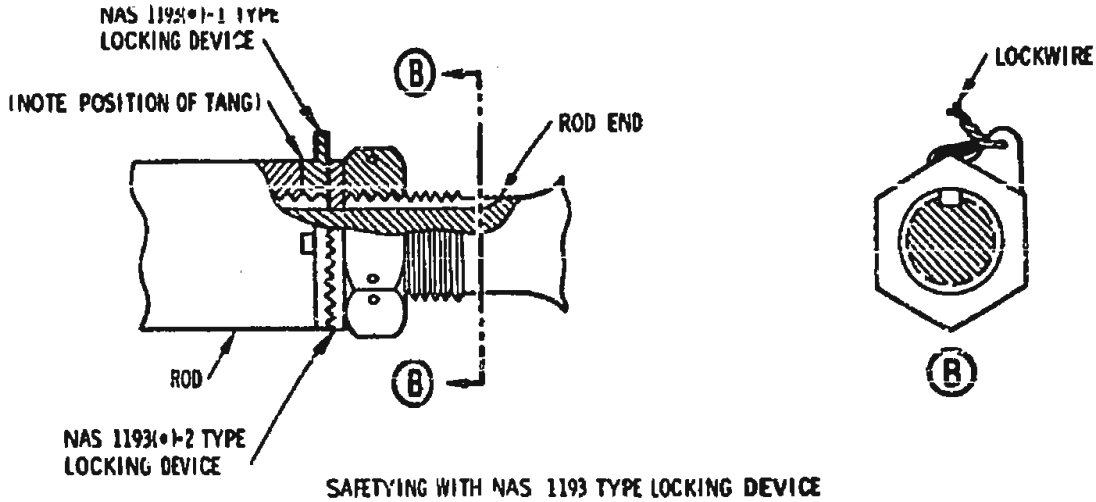
(7) Safety wire parts in such a manner that wire is put in tension when part tends to loosen.

CAUTION: IN ALL CASES WHERE LOCKWIRE IS USED IN FUEL TANKS, FOLD FREE END BACK AGAINST PART BEING SAFETIED TO NO SHARP ENDS PROTRUDE.

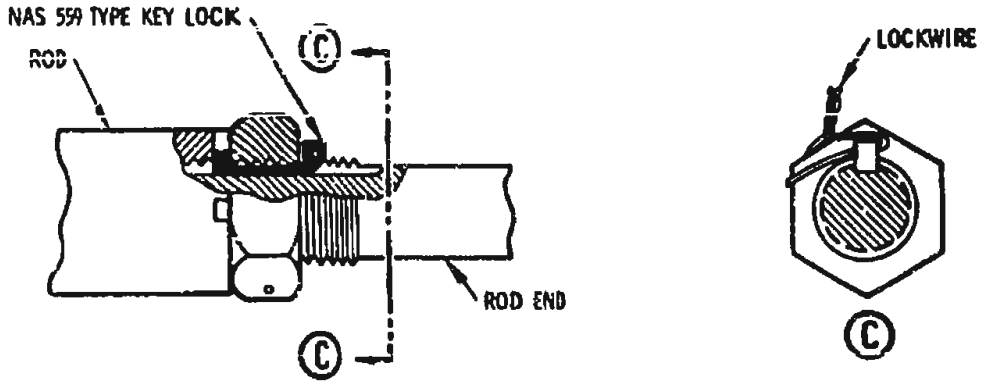
(8) Make pigtail of one-fourth to one-half inch (three to six twists) at end of wiring.



SAFETYING WITH NAS 513 TYPE WASHER



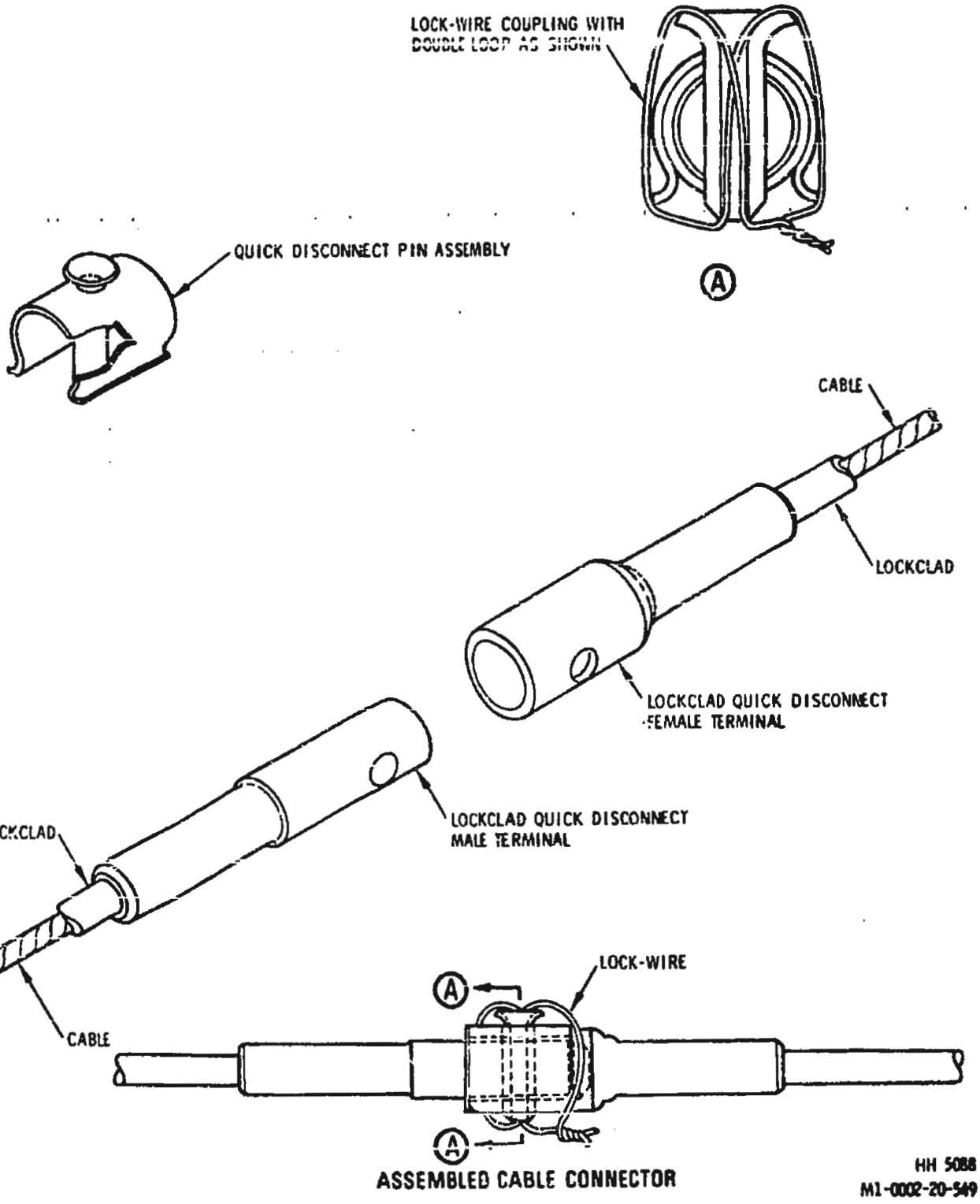
SAFETYING WITH NAS 1193 TYPE LOCKING DEVICE



SAFETYING WITH NAS 559 TYPE KEY LOCK

M1-0000-20-830

R Safetying of NAS 509 nuts
R Figure 202



R R Safetying of Quick Disconnect Pin
Figure 203

(9) Bend pigtail back or under to prevent it from becoming a snag.

B. Safetying of Castellated Nuts (Ref. Fig. 201)

(1) Tighten nut to correct torque value so that not less than 0.03 inch of bolt or screw extends through nut or when used with chamfered end bolts and screws, the full chamfer extends through nut.

(2) Follow safety wiring procedures as outlined in Paragraph 3.B. and Figure 201.

NOTE: Refer to Paragraph 5.A. for safetying of castellated nuts with cotter pin.

C. Safetying of Electrical and Electronic Connectors (Ref. Fig. 204)

CAUTION: IN ALL CASES WHERE LOCKWIRE IS USED IN FUEL TANKS, FOLD FREE END OR ENDS BACK AGAINST PART BEING SAFETIED SO NO SHARP ENDS PROTRUDE.

(1) Follow safety wiring procedures as outlined in Paragraph 3.B. and Figure 204.

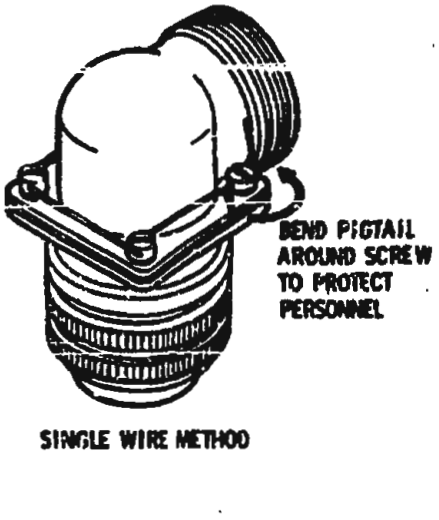
NOTE: Electrical receptacles can be safetied with single wire method by replacing one mounting screw with a drilled fillister head screw (Ref. Fig. 204).

(2) Identify each safetied connector by painting or affixing two one-fourth inch diameter red dots on opposite sides of plug and one-half inch diameter red dot on nearby structure or on part normally remaining with aircraft during modification or overhaul (Ref. Fig. 204).

NOTE: Locate dots in areas visible from normal maintenance access points.

5. Cotter Pin Safetying

CR NOTE: Corrosion resisting steel (stainless steel) cotter
CR pins must be used in flight control system
CR applications. Corrosion resisting cotter pins can be
CR identified by their metallic-gray color and lack of
CR magnetic attraction. Cotter pins are also required
CR on shear-type self-locking castellated nuts where the
CR bolt or stud is drilled for a cotter pin.


BEND PIGTAIL AROUND SCREW TO PROTECT PERSONNEL
SINGLE WIRE METHOD
SAFETY WIRE
REQUIRED TO SECURE ANGLE BACK SHELL
SOLID BACK SHELL ANGLE PLUG
ASSEMBLY NUT
BEND PIGTAILS TO PROTECT PERSONNEL
EITHER OF THESE SAFETY WIRES WILL SECURE THE PLUG
BEND PIGTAIL AROUND SCREW TO PROTECT PERSONNEL
A
SAFETY WIRE
1/2" RED DOT ON ADJACENT STRUCTURE (1 REQUIRED)
1/4" RED DOT (REQUIRED EACH SIDE OF PLUG)
IDENTIFICATION OF SAFETIED CONNECTOR
A
LESS THAN 60°
DOUBLE TWIST METHOD

M1-0002-20-548

Safetying of Electrical and Electronic Connectors
Figure 204

A. Safetying of Castellated Nuts (Ref. Fig. 205)

(1) Tighten nut to correct torque value so that not less than 0.03 inch of bolt or screw extends through nut or when used with chamfered end bolts and screws, the full chamfer extends through nut.

NOTE: Use washer under nut or use shorter fastener if more than 50 percent of cotter pin diameter is above nut castellation. A maximum of two washers are permitted under nut.

CAUTION: USE NEW COTTER PIN UPON EACH NEW APPLICATION.

(2) Select necessary materials listed on Table 201.

(3) Install cotter pin through nut castellations.

NOTE: Cotter pin should fit neatly into hole, with very little sideplay.

CAUTION: IN ALL CASES WHERE COTTER PINS ARE USED IN FUEL TANKS, FOLD FREE END BACK AGAINST PART BEING SAFETIED SO NO SHARP ENDS PROTRUDE.

(4) Bend top prong over bolt end.

NOTE: Prong must not extend beyond bolt diameter. Cut off if necessary.

(5) Bend bottom prong down towards washer.

NOTE: Prong must not rest against surface of washer. Cut off if necessary.

(6) On alternate wrap around method, bend prongs along sides of nut (Ref. Fig. 204).

NOTE: Prongs should not extend outward from sides of nut.

NOTE: On all cotter pin applications, prongs will be bent over a reasonable radius. Sharp-angled bends tend to break.

NOTE: Refer to Paragraph 4B. for safetying of castellated nuts with safety wire.

B. Safetying of Pulley Guard Pins (Ref. Fig. 205).

NOTE: Safetying is not required on NAS 427 Types K and T guard pins, or similar pins which have internal snap lock features.

WARNING: USE SEALANT IN WELL VENTILATED AREA. DO NOT INHALE VAPOR AND AVOID FLUID CONTACT WITH SKIN AND EYES. KEEP AWAY FROM HEAT, SPARKS AND OPEN FLAME.

(1) Apply sealant, MIL-S-8802 Type B, to head of loose pins.

NOTE: Do not use sealant on NAS 427 Type W pins.

CAUTION: USE NEW COTTER PIN UPON EACH NEW APPLICATION.

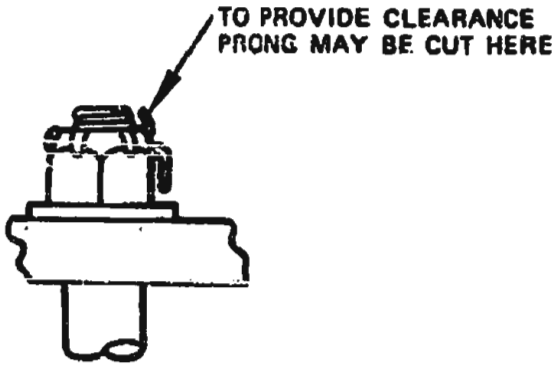
(2) Select necessary materials listed on Table 201.

(3) Install cotter pin through hole on pin.

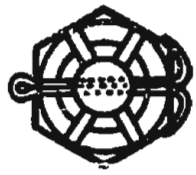
NOTE: Cotter pin should fit neatly into hole, with very little sideplay.

(4) Bend prongs to position shown on Figure 205.

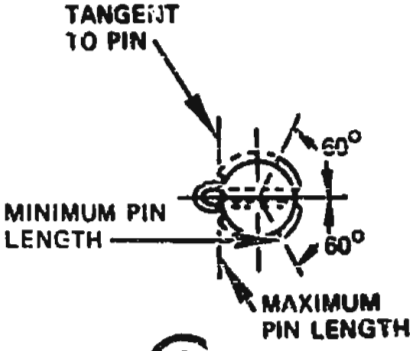
NOTE: On NAS 427 Type W pins, only when specified on the engineering drawing, will safety wire be installed at each end of guard pin so that the pin cannot turn in pulley bracket. The safety wire will be anchored by passing through another guard pin, the hole in the pulley bolt or through a No. 50 hole drilled in the pulley bracket.



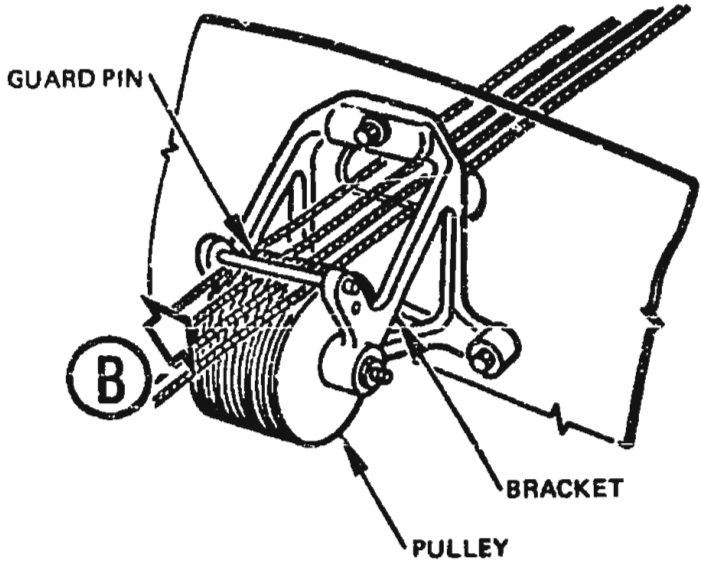
PREFFERRED METHOD
CASTELLATED NUT ON BOLT

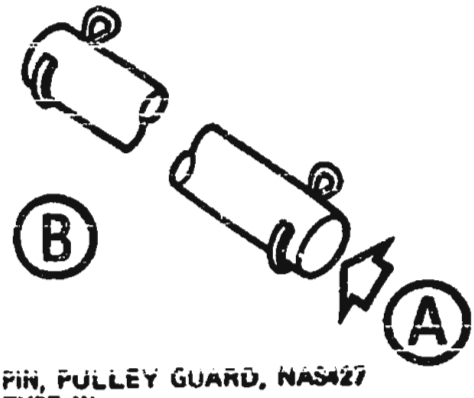


ALTERNATE METHOD
CASTELLATED NUT
ON BOLT



PIN APPLICATION





PIN, PULLEY GUARD, NAS427
TYPE W

M1-0002-20-546

R Typical Cotter Pin Installations
R Figure 205

R EFFECTIVITY: ALL
R
001B

CORROSION_PREVENTIVE_COATING_APPLICATION_-_MAINTENANCE_PRACTICES

1. General

This procedure establishes the requirements for application of corrosion preventive coating on aircraft.

2. Equipment_and_Materials

Corrosion Preventive Coating; LPS Research Laboratories, Inc., FSCM 32861, P/N LPS No. 3; Lockheed P/N EPS 39.2004 or equivalent

Solvent, Cleaning, 1-1-1 Trichloroethane; Open Vendor; Federal Specification O-T-620, or equivalent

Venturi type air movers

Clean clothes

Explosion proof lights

Squirt gun, One Quart Self - Contained Sprayer; Milwaukee Sprayer Co., FSCM 92997, Model "A" or equivalent

Tire inflation adaptor with quick change fitting for standard air hose

Dual cartridge organic vapor respirator (paint respirator)

Garden type airless sprayer

Paint brush

3. Maintenance_Practices

NOTE: Apply coating after painting, touch-up, sealing and adhesive bonding is completed.

A. Place NO SMOKING signs around area being processed.

NOTE: For confined areas such ac ECS, FESC and MESC, use only explosion-proof electrical fixtures in area being coated. Non-explosion proof lights and aircraft power must be disconnected except in open areas such as cargo bay.

CAUTION: AIR MOVERS MUST BE ELECTROSTATICALLY BONDED TO AIRFRAME STRUCTURE.

B. Install two venturi type air movers for evacuation of fumes.

NOTE: Air movers must be installed so that exhausted air is moved out of compartment where coating is being applied, but not into any other part of aircraft.

For very small compartments, such as the heat exchanger bay, air movers are not mandatory.

WARNING: USE TRICHLOROETHANE IN WELL VENTILATED AREA. DO NOT INHALE VAPOR AND AVOID CONTACT WITH SKIN OR EYES. EXPOSURE MAY RESULT IN LUNG, SKIN OR EYE IRRITATION.

KEEP VOLATILE CLEANING SOLVENTS IN AIR TIGHT CONTAINERS TIGHTLY CLOSED WHEN NOT IN USE.

KEEP SOLVENT SOAKED RAGS FROM ACCUMULATING IN WORK AREA.

C. Wipe all surfaces to be coated ensuring area is free of loose particles, chips, etc. Wipe up all hydraulic fluid, oil, water, etc., with a clean dry cloth prior to application of film. Where necessary, dampen cloth with trichloroethane for removal of oils, etc., and then wipe surface dry with clean cloth.

WARNING: WEAR DUAL CARTRIDGE ORGANIC VAPOR RESPIRATORS, PROTECTIVE GLOVES, AND EYE PROTECTION WHEN USING PREVENTIVE COATING. DO NOT INHALE VAPOR AND AVOID MATERIAL CONTACT WITH SKIN AND EYES. PROLONGED EXPOSURE MAY RESULT IN UNCONSCIOUSNESS OR SKIN AND EYE IRRITATION.

D. Apply corrosion preventive coating to all surfaces specified in Table 201, by squirt-type applicator, brushing or garden-type airless sprayer at ambient temperature.

NOTE: Ensure coating is applied into all faying surfaces, around fasteners and other areas that might entrap fluid.

Do not apply compound to surfaces that normally operate at temperatures 200 degrees Fahrenheit (93 degrees Centigrade) or to overheat sensors installed below air ducting.

Apply coating to skin attachments at a distance approximately one inch from skin in areas specified.

E. Apply coating at a rate of 1500 to 2000 square feet per gallon.

NOTE: Coating thickness should be held to a minimum. One light coat which just completely wets surface is adequate.

Exercise care to avoid too heavy a coating from being applied which will run down and create puddles.

F. Mop up puddles and areas of excessive buildup while coating is still in a fluid state.

G. Allow film to dry a minimum of two hours at 70 degrees Fahrenheit (21 degrees Centigrade) before installing insulation batts or other components that will enclose coated area and inhibit evaporation.

NOTE: Air movers must remain in operation until dry cycle is complete (approximately six hours).

Corrosion preventive coating forms a soft, non-hardening amber film.

4. Inspection and Check

A. Inspect application to ensure applied coating is uniform and soft film is free from bubbles, breaks, or other surface imperfections which expose underlying surface to environment.

B. Repair damage areas by applying coating as described in Paragraph 3, ensuring entire damage area is coated.

C. Strictly maintain drying cycle (Ref. Step 3G).

5. Handling and Transportation

A. Handle areas coated with preventive coating with care ensuring not to damage soft film.

C MIL-C-16173 Grade I

C 6. General

C This procedure establishes a requirement for application of
C corrosion preventative compound in the aircraft.

C 7. Equipment and Material

C A. Compound

C (1) MIL-C-16173 Grade I (50-1025)

C (2) MIL-C-11796B Grade II (50-0674)

C (3) Zinc chromate paste (50-0170)

C B. Tape

C (1) Foam Tape .125 x 1.0 (47-4130)

C Foam Tape .125 x 2.0 (47-4229), MIL Spec MIL-P-15280

C (2) Mylar Tape 22 in. wide (47-4159), Mfg. Y5685

C (3) Mylar Tape 1.25 in. wide (47-1733), Mfg. JLAR 910-1-1-2

C C. Solvent

C (1) Trichlorethylene (50-0180) (MIL-T-7003)

C D. Extrusion

TABLE 1 - AFFECTED AREAS

AREA
(A) SKINS AND ATTACHMENTS TO SKINS (STRINGERS, FRAMES, ETC)
1. BETWEEN BL 31.0 L/R FROM FS 128 TO FS 197
2. BELOW WL 140 FROM FS 197 TO FS 449
3. BELOW WL 140 FROM FS 983 TO FS 1363
(B) SKINS & STRUCTURE BELOW FWD, MID AND AFT CARGO COMPARTMENT FLOOR
(C) SKINS AND STRUCTURE BELOW GALLEY FLOOR
(D) SKINS AND STRUCTURE BELOW WL 140 BETWEEN FS 1792 AND FS 1835
(E) FORWARD FACE OF AFT PRESSURE BULKHEAD BELOW THE CABIN FLOOR BEAMS
(F) AFT FACE OF AFT PRESSURE BULKHEAD BELOW WL 153
(G) SKINS AND STRUCTURE BELOW WL 120 BETWEEN FS 943 AND FS 983 IN THE MAIN ELECTRICAL SERVICE CENTER

M1-0000-20-805

Affected Areas
Table 201

R EFFECTIVITY: ALL
R
002B

C (1) Seat track filler (52-0463), BAC 1522-275NAT

C 8. Maintenance Practices

C A. The corrosion preventative compound shall be applied to
C parts noted in Table 202 and 203.

C CAUTION: CORROSION PREVENTATIVE COMPOUND SHALL NOT BE PERMITTED
C TO DROP ON WIRING, CABLES, OXYGEN LINES OR OXYGEN
C TANKS.

C NOTE: Do not apply MIL-C-16173 with LPS-3 or equivalent or
C LPS-3 over MIL-C-16173 as LPS-3 will dissolve
C MIL-C-16173.

C B. Treatment of areas in Table 202 shall be accomplished as
C follows:

C (1) Remove foam tape from substructure where floor panels
C are removed.

C (2) All intercostals, floor beams, etc., which are to be
C replaced shall be cleaned with MEK, and primed with
C epoxy primer.

C (3) All floor beams or intercostals which have minor
C corrosion shall have corrosion removed within the
C limits of the Structural Repair Manual. Painting is
C not required if members are treated with MIL-C-16173.

C CAUTION: DO NOT ALLOW MIL-C-16173 COMPOUND TO DROP IN
C WIRING, CABLES, OXYGEN LINES OR OXYGEN TANKS.

C (4) Install 1 or 2 in. foam tape on lower side of floor
C panels.

C (5) Just before floor panels are installed, treat upper
C side of floor beams, sides of seat tracks, etc. with
C MIL-C-16173 compound.

C (6) Apply MIL-C-16173 compound on upper and lower side of
C each anchor nut. Use acid brush on lower side.

C (7) Install door panel after okay by Inspection.

C (8) Do not apply sealant between floor panels.

C (9) Apply MIL-C-16173 in seat tracks just before mylar is
C installed per Figure 201.

C (10) Clean off floor panels with solvent.

TABLE 202 COVERS THE TREATMENT OF AREAS IN THE CABIN

TABLE 202
1. FORWARD LAVATORIES INCLUDING 6.0 INCHES ON ALL SIDES IF THEY ARE EXPOSED.
2. FORWARD BEVERAGE BARS AND FORWARD SERVICE AREAS, 36.0 INCHES EACH SIDE OF THE CENTERLINE BETWEEN F.S. 300 AND 400.
3. UNDER AUX. BARS 6.0 INCHES FWD AND AFT AND 6.0 INCHES INBOARD.
4. GALLEY LIFT AREA, 48 INCHES FORWARD, 6.0 INCHES AFT AND 6.0 OUTBOARD OF RIGHT AND LEFT SIDE.
5. AFT SERVICE AREA, 48 INCHES EACH SIDE OF CENTERLINE BETWEEN F.S. 1515 AND 1580.
6. AFT LAVATORIES FWD TO F.S. 1763 AND 48.0 INCHES EACH SIDE OF CENTERLINE AT THE AFT BEVERAGE BAR.
7. ALL CABIN DOORS, 12 INCHES FWD AND AFT AND 12 INCHES INBOARD.

TABLE 203 COVERS THE TREATMENT OF FLOOR SUBSTRUCTURE IN THE LOWER COMPARTMENTS

TABLE 203
1. FLOOR SUBSTRUCTURE BELOW MAIN ELECTRICAL SERVICE COMPARTMENT (M.E.S.C.)
2. AREAS ADJACENT TO GALLEY LIFTS.
3. FLOOR SUBSTRUCTURE BELOW ALL GALLEY AREAS.
4. C-1 CARGO COMPARTMENT BETWEEN F.S. 609 AND 703.
5. C-2 CARGO COMPARTMENT BETWEEN F.S. 1625 AND 1371.
6. C-3 CARGO COMPARTMENT BETWEEN F.S. 1625 AND 1665.

M1-0000-20-836

C (11) Install 22 in. mylar tape over entire floor at cabin doors, galley service centers, aux bars and lavatories.

NOTE: Make certain all exposed aluminum floor substructure is coated with MIL-C-16173 compound before mylar is installed.

(12) After all lavatory, galley service centers, etc. are installed, fill all cavities with MIL-C-11796 grease and install tie downs.

(13) After door sills lavatory pans, vinyl floor coverings, etc. are installed, standard sealing procedures shall be followed.

C. Treatment of areas in Table 203 shall be accomplished as follows:

(1) Remove fiberglass drip pans (if installed) under lower galley floor panels and discard.

(2) All foam tape shall be removed from the floor beams and substructure in areas outlined in Table 203.

(3) All intercostals, floor beams, etc. which are to be replaced shall be cleaned with MEK, primed with epoxy primer.

(4) All other floor tracks and intercostals which have minor corrosion shall have corrosion removed within the limits of the SRM. Painting is not required if members are treated with MIL-C-16173.

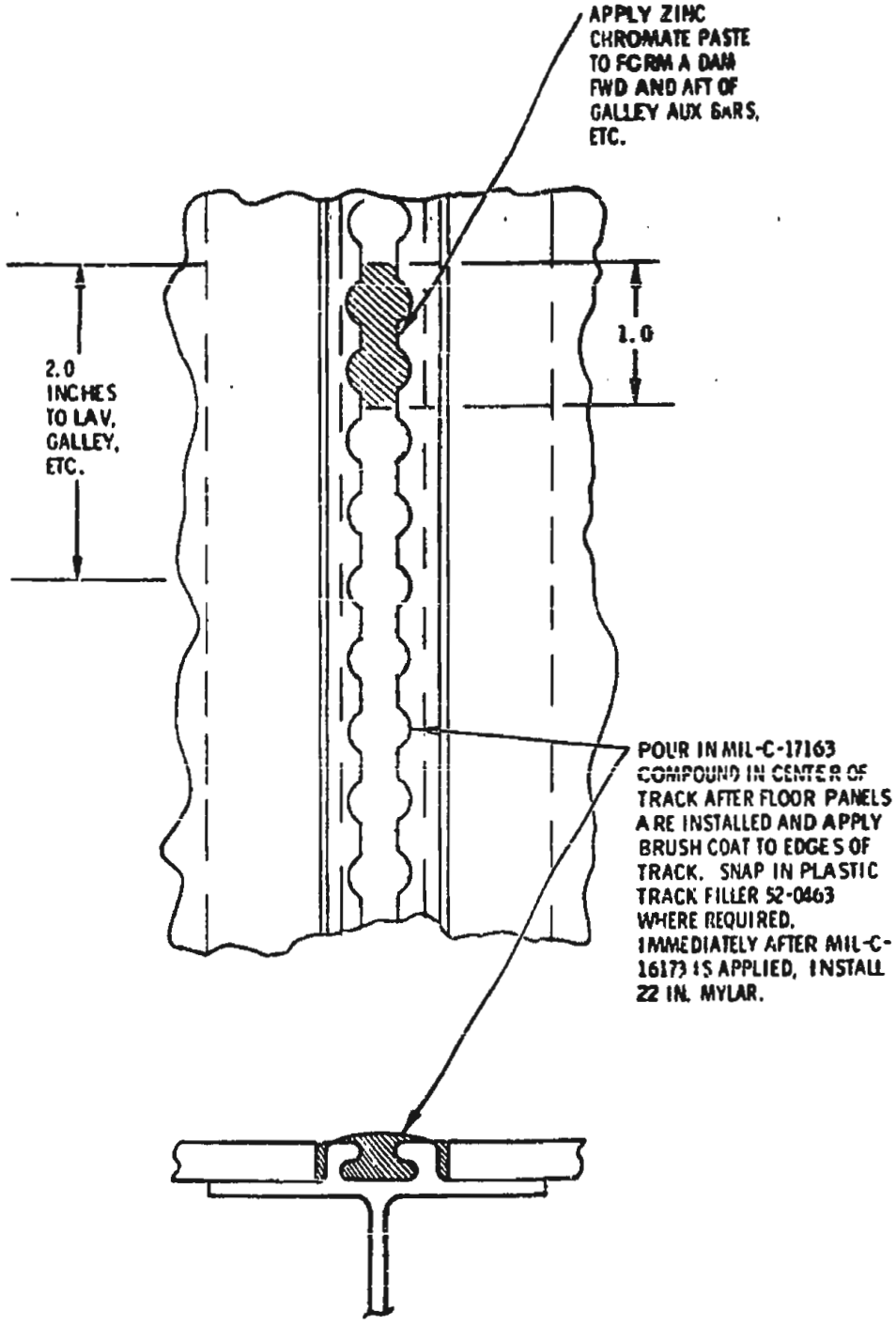
CAUTION: DO NOT ALLOW MIL-C-16173 COMPOUND TO DROP ON WIRING, CABLES, OXYGEN LINES, OXYGEN TANKS, OR HEAT DUCTS.

(5) Install 1 or 2 in. foam tape on lower side of floor panels.

(6) Apply brush coat of MIL-C-16173 compound to upper side floor beams and floor substructures and to lower side of anchor nuts. Use acid brush on lower side.

(7) Install floor panel after okay by Inspector

(8) Apply sealant between floor panels.


APPLY ZINC CHROMATE PASTE TO FORM A DAM FWD AND AFT OF GALLEY AUX BARS, ETC.
2.0 INCHES TO LAV, GALLEY, ETC.
1.0
POUR IN MIL-C-17163 COMPOUND IN CENTER OF TRACK AFTER FLOOR PANELS ARE INSTALLED AND APPLY BRUSH COAT TO EDGES OF TRACK. SNAP IN PLASTIC TRACK FILLER 52-0463 WHERE REQUIRED. IMMEDIATELY AFTER MIL-C-16173 IS APPLIED, INSTALL 22 IN. MYLAR.

VIEW A

M1-0000-20-837

C C Application of MIL-C-16173 to Seat Tracks
Figure 201

R R 0028 EFFECTIVITY: ALL

R METAL FOIL RUBSTRIPS - MAINTENANCE PRACTICES

R 1. General

R Procedures for installation of metal foil rub strips are
R contained in this section.

R 2. Equipment and Materials

R Methyl-Ethyl-Ketone, TT-M-261, or equivalent

R Cotton wiping rags, DDD-R-30, or equivalent

R Trichloroethane, Technical Inhibited (Methylchloroform),
R MIL-T-81533, Dow Chemical Co., or equivalent

R Petroleum base cleaner for primed metals non-photochemically
R reactive, 101 KE, Leeder Chemical Co., or equivalent

R Integral fuel tank sealing compound, PR7301, Products Research
R Corp., or equivalent

R Aerodynamic sealing compound, PR8501, Products Research Corp.,
R or equivalent

R 3. Maintenance Practices

R A. Cleaning

R (1) Clean both faying surfaces with cotton wiping rag
R dampened with Methyl-Ethyl-Ketone or Trichloroethylene
R and wipe dry with clean cotton wiping rag.

R B. Application of Sealant

R (1) Mix sealant in proportions recommended by manufacturer.

R (2) Apply smooth, even layer of sealant (PR8501)
R approximately .010 inches thick, completely covering
R one of two faying surfaces.

R NOTE: Use either PR7301 or PR8501 sealant for bonding.
R If PR7301 Type II is used, allow solvent in
R sealant to flash off for approximately twenty
R minutes before mating parts.

R (3) Apply equal and constant pressure on metal foil rub
R strip. Foil must conform to contour of substrate to

R which it is being bonded. Surface of foil must be
R smooth and evenly bonded.

R NOTE: Use a vacuum bag, or any other suitable means of
R obtaining equal and constant pressure.

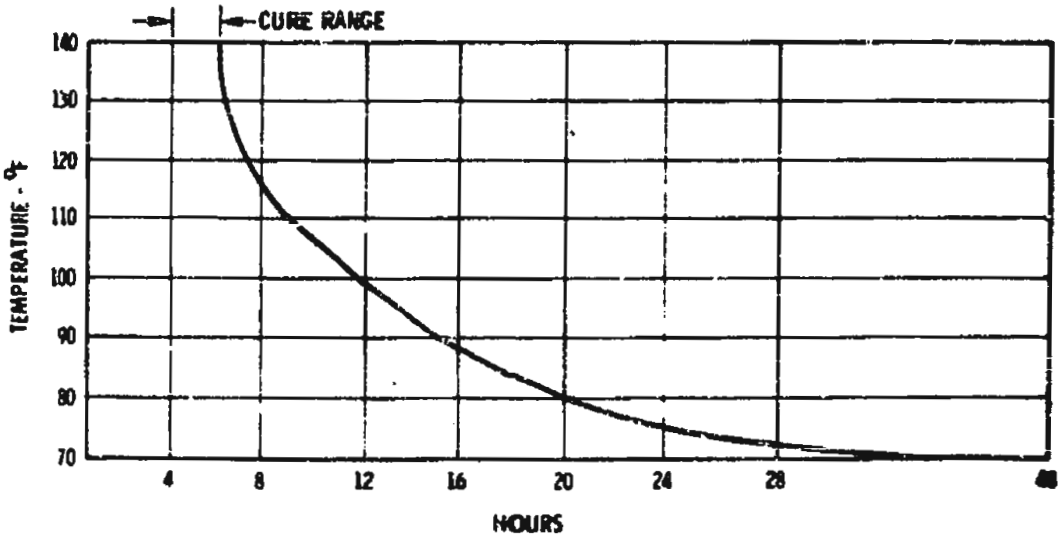
R (4) Apply vacuum of from twelve to twenty inches of mercury
R during cure period using vacuum bag. Maintain pressure
R for time and temperature shown in Figure 201.

R NOTE: Cure period may be shortened by heating (Ref.
R Fig. 201). Allow part to cool to less than
R 110°F before release of pressure.

R (5) Clean top surface of rub strip with clean cotton wiping
R rag dampened with Methyl-Ethyl-Ketone, Petroleum Base
R Cleaner or Trichloroethane and wipe dry with clean dry
R cotton wiping rag.

R CAUTION: THERE MUST BE NO VISIBLE EVIDENCE OF UNBONDED AREA
R WHEN VISUALLY INSPECTED PRIOR TO FILLET SEALING.

R (6) Edges of rub strip may raise slightly or show minor
R voids, especially at corners. A maximum gap of .010
R inch at raised edge is repaired by applying masking
R tape, leaving 1/16 to 3/16 inch gap beyond outer edge
R of rub strip. Fill the exposed area with Aerodynamic
R Sealing Compound, PR8501 (Ref. Fig. 202).



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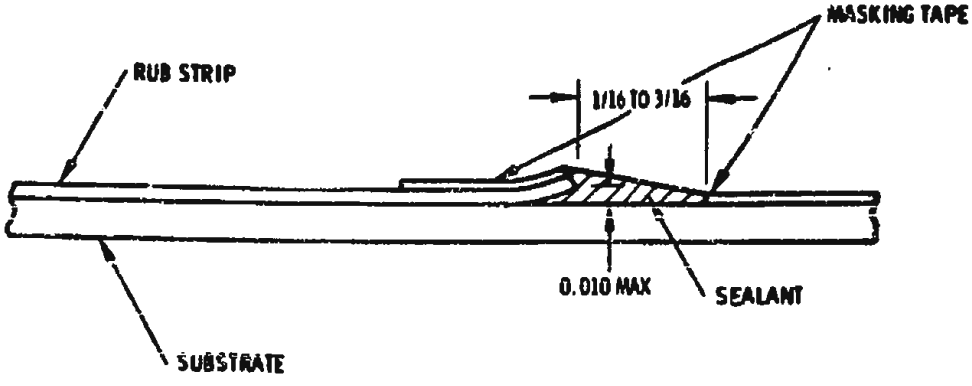
R Minimum Time/Temperature Cure Chart for Accelerated Cure
R Figure 201



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R
R

Edge Void at Corner Repair
Figure 202

EFFECTIVITY: ALL

0018

APPLICATION OF ABRASION RESISTANT COATING -

PB78-478

1. SCOPE

1.1 Scope. - This process bulletin establishes requirements for the application of an abrasion resistant coating on the L-1011 aircraft.

2. APPLICABLE DOCUMENTS

SPECIFICATIONS

Federal

TT-M-261	Methyl Ethyl Ketone

Lockheed

C-37-1301	Abrasion Resistant Coating (Laminar X-500, 7-W-53, Dexter Midland, Haryward, Calif.
LCM?7-1035	Epoxy Primer, Phosphate Ester Resistant

STANDARDS

Federal

FED-STD-141	Paint, Varnish, Lacquer, and Related Materials, Method of Inspection, Sampling and Testing

3. REQUIREMENTS

3.1 General requirements. - All structure in contact with the mating surfaces or those parts requiring a scuff resistant finish shall have the abrasion resistant coating applied in accordance with this process bulletin. When required by the Engineering drawing, mating surfaces shall have the coating applied to the areas specified.

3.1.1 Masking. - The structure or parts shall be masked to confine the abrasion resistant coating to the surfaces specified.

3.2 Surfaces to be primed and topcoated shall receive treatments required by the Engineering drawing prior to applying the coating system.

3.2.1 Previously treated surfaces. - Previously treated surfaces not primed within 72 hours of treatment shall be reactivated for coating by wiping with clean cloths saturated with TT-M-261 Methyl Ethyl Ketone. Wipe dry using clean dry cloths.

3.3 Application of LCM37-1035 phosphate ester resistant epoxy primer.

3.3.1 The primer shall be mixed according to manufacturer's instructions.

3.3.2 The primer shall be applied to an average dry film thickness of 0.5 to 0.7 mil. Application shall be by brush or spray.

3.3.3 The primer shall be applied in such a manner that the resulting finish shall be free from grit, seeds, blisters, pinholes or any other surface irregularities.

3.3.4 Prior to top coating, the primer shall be allowed to air dry for 1/2 hour minimum at 75 ± 10°F.

3.4 Application of abrasion resistant topcoat, C-37-1301.

3.4.1 The abrasion resistant topcoat shall be mixed according to manufacturer's instructions.

M1-0100-20-004

3.4.2 If the primer has dried more than 72 hours, the primed surface shall be abraded with 320 grit paper and reactivated by wiping with clean, lint free cloths saturated with TT-M-261 Methy Ethyl Ketone. The primed surface shall be wiped dry using clean, lint free dry cloth.

3.4.3 Apply the abrasion resistant topcoat, C-37-1301, by brush or spray. Unless otherwise specified on the Engineering drawing, the average dry film thickness shall be 6 - 8 mils. Multiple coats may be required and there shall be an air dry time of 20 to 40 minutes at 75 ± 10°F between coats.

3.4.4 The abrasion resistant topcoat shall be applied in such a manner that the resulting finish shall be free from grit, seeds, streaks, blisters, fisheyes or any other surface irregularities.

3.4.5 The abrasion resistant topcoat shall be dried as follows:

3.4.5.1 Air dry. - The topcoat shall be air dried for 16 hours minimum at 75 ± 10°F prior to handling.

3.4.5.2 Force dry. - The topcoat may alternately be force dried by allowing the topcoat to air dry a minimum of 10 minutes followed by force drying at 150 ± 10°F for a minimum of 2 hours. Allow the parts to cool for a minimum of 10 minutes at room temperature prior to handling.

3.5 Adhesion. - The applied abrasion resistant coating shall show no loss of adhesion when tested as specified in 4.2.

3.6 Safety and health precautions. - All precautions normally used in mixing and applying organic coatings must be observed when mixing and applyint the coating system. Painting may be done outside a paint booth providing safety regulations are met. The mixed uncured components of this material will produce irritation upon contact with the skin, eyes, or clothing. Avoid breathing vapors. When handling the components of this material, avoid contact with the body, especially on open breaks in the skin; avoid ingestion (swallowing). Always wash hands thoroughly before eating or smoking.

4. QUALITY ASSURANCE PROVISIONS

4.1 Testing. Testing shall be conducted at the discretion of Quality Assurance to insure conformance to the requirements of this bulletin.

4.2 Adhesion. - Testing to determine adhesion of the abrasion resistant coating shall be carried out after the topcoat has air dried for a minimum of 16 hours at 75 ± 10°F or force dried for 2 hours minimum at 150 ± 10°F. Testing may be carried out on production parts or test coupons primed and topcoated concurrently with the parts. Apply a sponge saturated with water and covered by a plastic cap to the coated surface to be tested. Remove the sponge and cap after 24 hours and wet tape test the surface as specified in FED-STD-141, Method 6301, except the surface shall not be scribed.

4.3 Thickness. - The thickness of the primer and topcoat may be determined with a micrometer or equivalent measuring device on taped test panels primed and topcoated concurrently with the parts or on the production parts utilizing a suitable non-destructive technique.

5. HANDLING AND TRANSPORTATION

5.1 Coated parts shall be handled and transported in such a manner as will insure that the required physical characteristics and properties are preserved.

6. NOTES

6.1 There is no Government specification covering the requirements of this Process Bulletin.

6.2 This revision supersedes PB78-478 dated 10-10-69 and Amendment #2 dated 10-9-70.

R SCREW RETAINERS - MAINTENANCE PRACTICES

R 2. General

R For certain critical screw assemblies a foldover, sheet metal
R retainer is used to prevent loss of the screw in the event the
R nut backs off. An example of the retainer use is the spoiler
R upper arm assembly (Ref. Fig. 201).

R The retainer has two clevis bosses through which an axial safety
R wire attaches the retainer to the arm assembly. After the screw
R is installed the retainer is folded over the screw head and
R attached by lock-wiring it to a matching hole in the assembly.
R The retainer shape is offset to conform to the assembly
R configuration and may easily be reversed. A reversed retainer
R installation, when folded over, results in a mismatch of the
R lockwire holes. The retainer hole must be in line with the arm
R assembly hole if a proper lockwire joint is made.

R The following provides instructions for installing and
R lockwiring screw retainers. This procedure is typical for all
R fold-over type screw retainers.

R 2. Referenced Procedure

R 20-00-06 Safetying Practices LCP71-1098A

R 20-51-01 Bolts and screws - Maintenance Practices

R 3. Maintenance Practices

R A. Installation

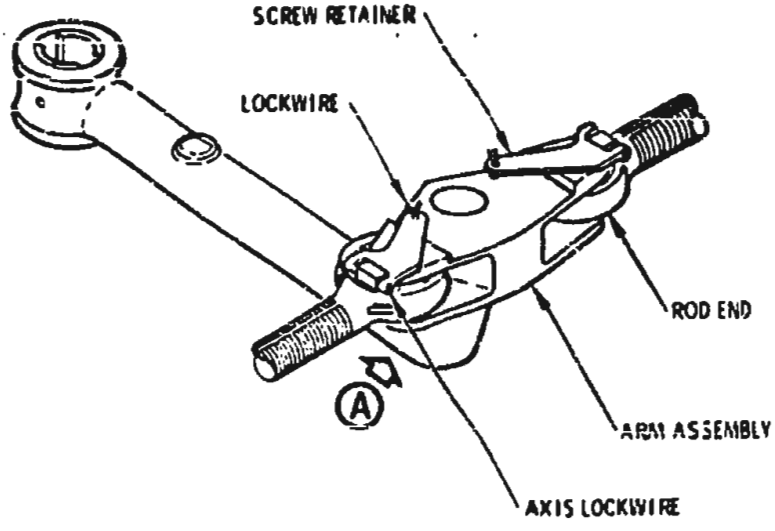
R CAUTION: INSURE RETAINERS ARE NOT REVERSED AND LOCKWIRE
R HOLES ARE IN LINE BEFORE INSTALLING.

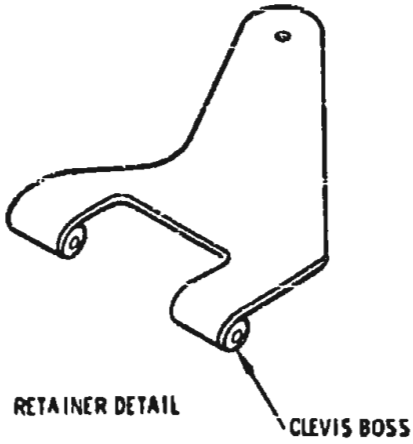
R (1) Install screws and torque nuts (Ref. 20-51-01).

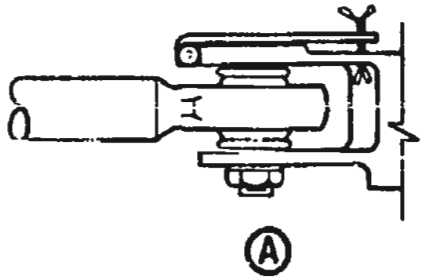
R (2) Place retainer over screw head aligning lockwire holes.
R Check position of clevis bosses over axis hole to
R determine correct fold-over side.

R (3) Lockwire retainer to arm assembly hole (Ref. Fig. 201).

R (4) Fold retainer over head of screw and lockwire to
R fitting hole (Ref. 20-00-06).







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R
R Lockwiring Screw Retainers
Figure 201

R EFFECTIVITY: ALL
R
001B

R

ALIGNMENT OF CONTROL CABLE SEALS

1. General

This procedure establishes alignment requirements for non-rubber control cable seals.

2. Equipment and Materials

Corrosion Preventive Compound, Solvent Cutback, Cold Application: Open Vendor; MIL-C-16173 Grade 4; or equivalent.

Opaquing Fluid, White, Waterbase: Liquid Paper Corp., (FSCM26333), P/N 710; Lockheed Stationery Supply Code No. 50698; or equivalent.

Flashlight

3. Maintenance Practices

A. Alignment of non-rubber control cable seals.

R (1) Verify pressure seals are correctly oriented toward
R pressurized side (Ref. Fig. 201).

R (2) Place completely rigged control cable system in its mid-travel or neutral position.

R (3) Wipe area of cable that passes through the seal with a clean, dry cloth to remove dirt, chips and other foreign material.

R (4) Install control cable seal so cable is centered in seal opening.

WARNING: DO NOT ALLOW FLUID TO CONTACT SKIN OR EYES. PROLONGED EXPOSURE MAY RESULT IN SKIN OR EYE IRRITATION.

R (5) Thoroughly mix opaquing fluid by vigorously shaking bottle.

NOTE: If fluid consistency is to thick, add small amounts of water until proper consistency is obtained.

R (6) Apply a one-fourth to one-half inch wide coating of opaquing fluid to full cable circumference in area "B"

(Ref. Fig. 201), one to two inches away from cable seal, dimension "A" (Ref. Fig. 201).

R (7) Let opaquing fluid dry for about three minutes, or until coated surface develops a flat appearance.

R (8) Inspect coated area for full circumferential coverage and bare wires in area "B" (Ref. Fig. 201), reapply opaquing fluid if necessary.

NOTE: Coating thickness should just lightly cover all the cable wires in area "B". When properly applied, contour of cable wires should be discernible. Two thin coats are usually better than one heavy coat.

R (9) Cycle control cable system through its entire travel range so that coated area of cable passes through seal 10 to 12 times as control system moves from one stop position to the opposite stop position.

R (10) Return control cable system to its mid-travel or neutral position.

R (11) With aid of a flashlight, visually inspect appearance of coated area in accordance with the following requirements to determine acceptability of seal alignment.

(a) Cable seal alignment is acceptable if coated area does not have a shiny appearance and if no bare cable wires are visible.

(b) Cable seal alignment is unacceptable if coated area is shiny or bare cable wires are visible.

R (12) If cable seal alignment is unacceptable, slightly loosen seal retaining screws and adjust seal alignment in a direction opposite to the rubbed area on the
R cable. Repeat Steps 3A(5) through 3A(11).

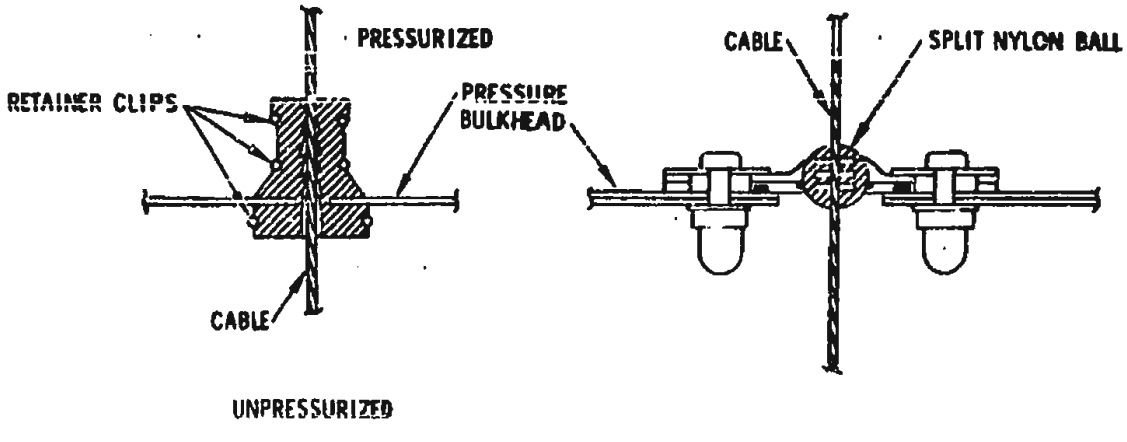
R (13) If after repeated adjustments an acceptable seal alignment can not be obtained, problems will be reported to the cognizant Engineering organization for investigation.

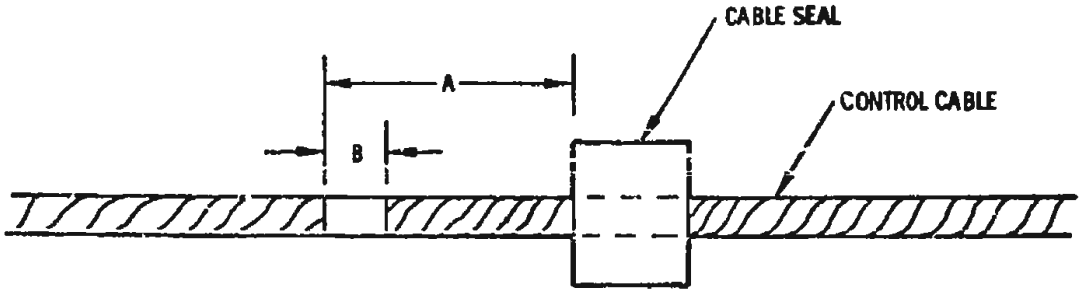
R (14) After satisfactory alignment, remove opaque coating by brushing it off with a stiff bristle brush and wiping area with a clean dry cloth.

WARNING: DO NOT ALLOW COMPOUND TO CONTACT EYES. PROLONGED EXPOSURE MAY RESULT IN EYE IRRITATION. KEEP COMPOUND AWAY FROM HEAT, SPARKS OR OPEN FLAME. FAILURE TO COMPLY MAY RESULT IN MATERIAL COMBUSTION.

R (15) Touch up entire cable length which was wiped clean in Step 3A(3) with MIL-C-16173, Grade 4, corrosion preventive compound.

R (16) Allow corrosion preventive compound to dry for a minimum of four hours.





A = 1 TO 2 INCHES, WHATEVER IS CONVENIENT

B = 1/4 TO 1/2 INCH CIRCUMFERENTIAL AREA COATED WITH OPAQUING FLUID

M1-C201-20-852

R Control Cable System in Neutral Position
R Figure 201

R EFFECTIVITY: ALL
R
001B

STANDARD PRACTICES - REQUIRED PLACARDS

R 1. General

R Standard practices pertaining to required placards are contained
R in this section.

DECALS - APPROVED REPAIRS

1. Approved Repairs

Repair of decals on the exterior and interior surfaces of the aircraft is accompanied by the application of new decals.

R Requirements for the application to exterior and interior
R aircraft surfaces of decalcomanias, fluid line identification
R tape, and other similar plastic films, referred to as decals,
R are contained in 20-11-03.

STENCILS - APPROVED REPAIRS

1. General

Repair of stencils on aircraft surfaces is limited to the application of a new stencil.

R Requirements for the application of stencils to exterior and
R interior aircraft surfaces are contained in 20-11-04.

2. Equipment and Materials

Methyl-Ethyl-Keytone, TT-M-261

Scotchbrite Type "A" pads, or equivalent

Phosphoric Acid cleaner, LCM32-1248

3. Approved Repairs

To repair stenciled areas which are applied over painted surfaces, first repaint the surface if needed then reinstall the stencils per LCP78-2051A. If the stencil is applied over bare metal, prepare the surface as follows prior to applying the stencil:

(1) Clean surface with TT-M-261, Methyl-Ethyl-Keytone.

(2) Abraid surface with Scotchbrite Type "A" pads and water.

(3) Spray rinse the abraided surfaces with water.

(4) Apply Phosphoric Acid cleaner, LCM32-1248. Do not allow surface to dry before rinsing with water.

R APPLICATION OF DECALS, FLUID LINE IDENTIFCATION TAPE, AND SIMILAR
R PLASTIC FILMS TO EXTERIOR AND INTERIOR AIRCRAFT SURFACES --
R LCP82-1007A

R 1. General

R This procedure establishes requirements for the application of
R decals, fluid line identification tape, printable coating film,
R and other similar plastic films, to interior and exterior
R aircraft surfaces.

R 2. Equipment and Materials

R Methyl-Ethyl-Ketone (for use in organic coatings), TT-M-261, or
R equivalent

R Aliphatic Naptha, TT-N-95, or equivalent

R Paint Thinner, Volatile Spirits, (Petroleum-Spirits), TT-T-291,
R or equivalent

R Spar Varnish, Alkyd-Resin, TT-V-109, or equivalent

R Cement, Vinyl Coated Trim, (3M Co., No. EC-1099, Stabond Corp.,
R C-111), or equivalent

R Gloss Topcoat, Polyurethane, (Sterling Lacquer Mfg. Co., No.
R U-series)

R Cloths, Lint-Free

R Adhesive Activator, (Myercord Co., No. 1505, Canada Decalcomania
R Co. Ltd. No. 1505), or equivalent

R Edge Sealer, for use on polyester or vinyl decals, (3M Co., No.
R 4150, Dexter Midland, No. 1-C-26), or equivalent

R Edge Sealer, for use on reflective film, (3M Co., No. 700
R Sealer), or equivalent

R Protective Coating, for sealant, decals and markings, (Bostik,
R 473-20 Clear Epoxy, Deft Inc., 01-X-20 Clear Epoxy), or
R equivalent

R 3. Maintenance Practices

R A. Pre-application

R (1) Visually inspect decals to insure no cracks, discontinuities or creases are present. On pressure sensitive adhesive decals, inspect for discontinuities and delamination of adhesive.

R (2) If necessary, cut decal to proper size prior to application.

R NOTE: Note no cutting is permitted on aircraft skin except at skin overlaps and access panels.

R (3) Cut holes in decals for all access panel screws, and whenever practicable, prior to decal application.

R WARNING: USE NAPTHA IN WELL-VENTILATED AREA. DO NOT INHALE VAPOR AND AVOID CONTACT WITH SKIN AND EYES. PROLONGED EXPOSURE MAY RESULT IN RESPIRATORY SYSTEM, SKIN OR EYE IRRITATION.

R (4) Clean surface with clean, lint free cloths dampened with TT-N-95 naptha.

R (5) Immediately wipe surfaces dry while solvent is still wet, using clean lint-free cloths.

R NOTE: Cleaning process must be done within 10 minutes prior to decal application.

R WARNING: USE ADHESIVE IN WELL-VENTILATED AREA. DO NOT INHALE VAPOR, AND AVOID MATERIAL CONTACT WITH SKIN OR EYES. PROLONGED EXPOSURE MAY RESULT IN RESPIRATORY SYSTEM, SKIN, OR EYE IRRITATION.

R (6) On sound proof blankets and pourous surfaces, apply cement and allow to dry four to six minutes before applying decal.

R NOTE: After cleaning, do not touch surfaces or allow them to become contaminated.

R WARNING: KEEP VOLATILE CLEANING SOLVENTS IN AIR-TIGHT CONTAINERS. KEEP CONTAINERS TIGHTLY CLOSED WHEN NOT IN USE. KEEP SOLVENT SOAKED RAGS FROM ACCUMULATING IN WORK AREA.

R B. Application

R CAUTION: APPLY DECALS WHEN SURFACE TEMPERATURES BELOW 65 DEGREES FAHRENHEIT (18.3 DEGREES CENTIGRADE).

WRAP DECAL WITH CAUTION TO PREVENT ENTRAPMENT OF AIR AND WRINKLES ON CURVED SURFACES.

FOR MULTIPLE PIECE EXTERIOR DECALS, OVERLAP ADJOINING EDGES ONE-HALF TO ONE INCH, WITH EDGES IN DIRECTION OF AIRFLOW.

DO NOT APPLY DECALS WITHIN THREE-FOURTHS OF AN INCH OF STATIC PORTHOLES, OR CLOSER THAN ONE-EIGHTH OF AN INCH FROM LEADING EDGES AND EDGES OF OPENINGS, ANTENNAS AND PITOT TUBES.

NOTE: Large or intricate decals may be supplied with a special low tack adhesive paper, on the message side, to maintain shape through application.

On large decals, peel off backing for a short distance, fold backing under, and pull off as decal is squeegeed in place.

When applying decals or fluid line tape on tubing, overlap ends one inch, except on high heat ceramic type decals.

Cut decal at time of application and press edges into openings at skin overlaps and access panels.

(1) Pressure-sensitive adhesive decals.

(a) Carefully strip off the backing paper, ensuring adhesive is not touched.

(b) Press decal into place in such a manner that no air bubbles are entrapped under film.

(2) Water transfer decals.

WARNING: USE VARNISH IN WELL-VENTILATED AREA. DO NOT INHALE VAPOR, AND AVOID FLUID CONTACT WITH SKIN. PROLONGED EXPOSURE MAY RESULT IN DIZZINESS OR NAUSEA. KEEP VARNISH AWAY FROM HEAT, SPARKS, AND OPEN FLAME. FAILURE TO COMPLY MAY RESULT IN MATERIAL COMBUSTION.

R WARNING: USE THINNER IN WELL-VENTILATED AREA. DO NOT
R INHALE VAPOR, AND AVOID FLUID CONTACT WITH
R SKIN OR EYES. PROLONGED EXPOSURE MAY RESULT
R IN DIZZINESS, NAUSEA, OR SKIN OR EYE
R IRRITATION. KEEP THINNER AWAY FROM HEAT,
R SPARKS, AND OPEN FLAME. FAILURE TO COMPLY
R MAY RESULT IN MATERIAL COMBUSTION.

R (a) If the receiving surface is rough, or only primed,
R apply a coat of TT-V-109 varnish, thinned with
R equal volume of TT-T-291 thinner. Allow varnish
R to dry until it is dry to a light touch, but tacky
R when pressure is applied.

R NOTE: Do not apply varnish if the receiving
R surface is smooth.

R (b) Immerse decal in clean water, maintained at 65 to
R 95 degrees Farhenheit (18.3 to 35 degrees
R centigrade), until decal paper is saturated, 30
R seconds maximum.

R (c) Place proper side of decal on receiving surface,
R and slide backing paper from between surface and
R decal.

R NOTE: Do not use additional water in transferring
R the decal.

R (d) Smooth decal, being careful to remove all excess
R water and air bubbles from under decal.

R NOTE: Do not continue to wipe after bubbles have
R been removed.

R (e) To remove excess varnish from around decal, wash
R surface with clean lint-free cloths dampened with
R TT-T-291 thinner.

R (f) Immediately wipe surface dry.

R (g) To remove excess dextrine from decal face, allow
R decal to set sufficiently, prior to washing, to
R prevent decal dislocation. Wash face of decal
R with clean, lint-free cloths dampened with clean
R water.

R (h) Immediately wipe dry while surface is still wet.

R (3) High heat resistance ceramic type decals.

R NOTE: Ends of decals wrapped around a part must not
R overlap as adhesion will be impaired. Trim as
R required.

R WARNING: USE ADHESIVE ACTIVATOR IN WELL-VENTILATED
R AREA. DO NOT INHALE VAPOR, AND AVOID
R MATERIAL CONTACT WITH SKIN OR EYES.
R PROLONGED EXPOSURE MAY RESULT IN RESPIRATORY
R SYSTEM, SKIN, OR EYE IRRITATION.

R (a) Activate the adhesive on decal by immersing for 5
R to 10 seconds in solution of 12 parts water and 1
R part of adhesive activator.

R (b) Place the decal, adhesive side down, on clean
R receiving surface. Squeegee or wipe smooth.

R (c) Remove the protective paper.

R (d) Wipe decal with a clean, lint-free cloth wet with
R water to remove all dextrine surface coating.

R (e) Immediately wipe surface dry using clean, dry,
R lint-free cloths.

R CAUTION: IF ALL SURFACE DEXTRINE IS NOT REMOVED, DECAL
R MAY BUBBLE, CRACK, OR STAIN DURING THE CURING
R BAKE.

R (f) Air dray for 24 hours, or force dry for 30 minutes
R minimum at 140 to 160 degrees Fahrenheit (60 to 71
R degrees centigrade).

R (g) Cure decal by placing part in an oven at 200
R degrees Fahrenheit (93.2 degrees centigrade)
R maximum temperature, then increasing temperature
R to 400 to 425 degrees Fahrenheit (204 to 218
R degrees centigrade) and baking the part for 30 to
R 45 minutes.

R NOTE: Time will start when part reaches 400
R degrees Fahrenheit (204 degrees
R centigrade).

R C. Post-application

R (1) Do not remove message-side adhesive paper until a
R minimum of 10 minutes after the completion of decal
R application, except that for high heat resistant
R ceramic decals, the message-side adhesive paper must be
R removed prior to drying and baking operations.

R NOTE: Water transfer decals can be handled in 30
R minutes if care is exercised. Complete drying
R and maximum strength will take approximately 24
R hours.

R (2) Edge sealing of exterior decals.

R WARNING: USE SEALER IN WELL VENTILATED AREA. DO NOT
R INHALE VAPOR, AND AVOID FLUID CONTACT WITH
R SKIN OR EYES. PROLONGED EXPOSURE MAY RESULT
R IN RESPIRATORY SYSTEM, SKIN, OR EYE
R IRRITATION.

R NOTE: After application, edges and cuts at skin breaks
R must be sealed with applicable edge sealer (Ref.
R Equipment and Materials).

R (a) Apply edge sealer, one-eighth to one-fourth inch
R on each side of decal edge, to prevent lifting.

R (b) After edge sealer has dried, apply a second coat
R to leading edge of decal and leading edge of any
R cut in decal.

R (3) Edge sealing of interior water transfer decals.

R (a) After application, coat edges with unthinned
R TT-V-109 varnish, one-eighth to one-fourth inch on
R each side of decal edge, to prevent edge lifting.

R NOTE: High heat resistant ceramic type decals are
R exempt from this requirement.

R (4) Top coating decals, and fluid line tape subject to
R contact with phosphate ester hydraulic fluid.

R WARNING: USE COATINGS IN WELL VENTILATED AREA. DO NOT
R INHALE VAPOR, AND AVOID FLUID CONTACT WITH
R SKIN AND EYES. PROLONGED EXPOSURE MAY RESULT
R IN DIZZINESS OR SKIN OR EYE IRRITATION. KEEP
R AWAY FROM HEAT, SPARKS AND OPEN FLAME.
R FAILURE TO COMPLY MAY RESULT IN MATERIAL
R COMBUSTION.

R (a) Topcoat hydraulic fluid line tape applied to bare
R metal tubing with Protective Coating for Sealant
R (Ref. Equipment and Materials) to protect them
R from exposure to phosphate ester hydraulic fluid.

R (b) Topcoat decals and printable labels, in the areas
R listed below, with Gloss Topcoat, Polyurethane

R (Ref. Equipment and Materials) to protect them
R from exposure to phosphate ester hydraulic fluid.

R Areas inside the fuselage below WL200 and aft
R of station 212.

R All wheel wells.

R Afterbody below WL442.

R All painted hydraulic lines.

R Trailing edges of the wing.

R Plumbing to ram air turbine.

R Left-hand wing leading edge lines for the slat
R drive.

R NOTE: Apply protective coating only to clean
R surfaces. Protective coating may be
R applied over fresh sealing compounds.

R (c) Clean surfaces to which coating is to be applied
R by wiping with clean cloth dampened with TT-N-95
R naptha.

R (d) Wipe surface dry with a clean cloth before naptha
R evaporates.

R (e) Apply coating material, mixed in accordance with
R manufacturers instructions, by spraying or
R brushing to form a cured dry film thickness of 0.5
R to 1.0 mil.

R (f) Cover the sealant, decal or fluid line tape
R completely and overlap adjoining substrate a
R minimum of one-fourth inch. Allow coating to dry
R to a tack-free condition for approximately one
R half hour before handling.

R NOTE: The topcoating must be free of pinholes,
R bubbles, voids or orange peel appearance.
R Coating must have complete adhesion to the
R substrate.

R (g) Fully cure topcoat, by air drying for seven days
R before exposing to phosphate ester fluids.

R D. Removal for water transfer decals

R WARNING: USE METHYL-ETHYL-KETONE IN WELL-VENTILATED AREA.
R AVOID FLUID CONTACT WITH SKIN AND EYES. PROLONGED
R EXPOSURE MAY RESULT IN SKIN OR EYE IRRITATION.
R KEEP AWAY FROM HEAT, SPARKS AND OPEN FLAME.
R FAILURE TO COMPLY MAY RESULT IN MATERIAL
R COMBUSTION.

R (1) Soften decal by applying a clean, lint-free cloth
R dampened with MEK. After several minutes, remove the
R decal by rubbing with the MEK dampened cloth.

R (2) After the decal has come off, a coating of cement may
R remain on surface. Remove by rubbing with a clean,
R lint-free cloth dampened in water.

R NOTE: MEK will remove some paints. If necessary to
R touch up areas, allow a drying time of 8 hours
R before applying a new decal.

R APPLICATION OF STENCIL ENAMEL, POLYURETHANE
R MAINTENANCE PRACTICES

R 1. General

R This Procedure establishes requirements for application of
R LCM37-2092 Types I and III Stencil Enamel.

R 2. Equipment and Materials

R Enamel, Stencil; Midland Div. Dexter Corp., (FSCM98795) P/N
R Laminar 500 with 10-C-32 Catalyst; Lockheed P/N LCM37-2092 or
R equivalent.

R Rags, Tack; Open Vendor.

R Tape, Paper, Pressure Sensitive; 3M Co., (FSCM52156) P/N No.
R 250; Lockheed P/N EPS24.1520 or equivalent.

R 3. Referenced Procedures

R FEDERAL STANDARD-
R 141-Method 6301 Paint, Varnish,
R Lacquer, and
R Related Materials;
R Methods of Inspection
R Sampling, and Testing

R 4. Maintenance Practices

R A. Surface Preparation

R (1) Complete all other operations before applying stencil
R enamel.

R B. Mixing and Thinning

R CAUTION: DO NOT MIX ENAMEL MATERIALS SUPPLIED BY DIFFERENT
R MANUFACTURERS.

R (1) Mix and thin LCM37-2092 Stencil Enamel according to
R manufacturers instructions.

R C. Application

R CAUTION: DO NOT USE KNIFE OR ANY METAL BLADE IN APPLICATION
R PROCEDURE

R REMOVE MASKING TAPE USED IN APPLICATION OF
R INSIGNIA AND MARKINGS AS SOON AS PRACTICABLE TO
R AVOID STAINING OF PRINTED SURFACE

R DO NOT APPLY LCM37-2092 STENCIL ENAMEL OVER LAQUER

R (1) Apply stencil enamel to prepared surface, cleaned with
R tack rag, within eight hours from time of initial
R mixing. Throw away enamel not used within this period.

R NOTE: Avoid any method that causes ridges in
R application of insignia and markings as much as
R possible.

R D. Drying Time

R (1) Allow enamel to dry sufficiently hard before handling
R to prevent damage to marking. Enamel will dry hard
R within eight hours and achieve full hardness within 24
R hours.

R E. Appearance

R (1) After drying, enamel must be smooth in appearance and
R free from sags, runs, streaks, blisters, cracks,
R lifting, wrinkles, or other surface irregularities.

R F. Color

R (1) Color of applied markings must be in accordance with
R engineering drawing.

R G. Film Thickness

R (1) Allowable maximum dry film thickness of applied enamel
R markings is 0.0010 inch.

R H. Adhesion

R (1) Applied stencil must show no loss of adhesion when
R tested per Para. 4.I.

R I. Inspection and Check

R (1) Apply a strip of EPS24.1520 tape, one inch by six
R inches in size, to fully dried coating (24 hours),
R adhesive side down.

R (2) Pull tape off from one end with a rapid motion and
R check for loss of adhesion.

R (3) Apply a sponge saturated with water and covered with a
R plastic cap to coating to be tested after coating has
R dried for 48 hours.

R (4) Remove sponge and plastic cap after 24 hours of soaking
R enamel.

R (5) Tape test wetted surface as specified in FEDERAL
R STANDARD-141, Method 6301, except surface must not be
R scribed.

R J. Smoothness

R (1) Conduct frequent and regular inspection tests to insure
R smoothness by drawing fingertips across finish in
R various directions, surface must conform to Para. 4.E.

R NOTE: LCM37-2092 Stencil Enamel is primarily intended
R for marking on bare metal or plastics; it is
R also suitable for marking on epoxy and
R polyurethane enamels.

R APPLICATION OF LAMINATED AND SOLID PLACARDS

R 1. General

R These procedures outline the steps to be performed to properly
R install placards. Proper cleaning of application surfaces, and
R careful handling of placards is vital to good bonding of a
R placard.

R 2. Equipment and Materials

R Isopropyl Alcohol, TT-I-735

R Cloths, Soft, Clean, Dry

R Tool, plastic wiper

R 3. Application

R A. Preparation

R (1) Just prior to placard installation, clean receiving
R surface thoroughly using clean cloth wet with Isopropyl
R Alcohol, TT-I-735.

R (2) While cleaned surface is still wet, wipe dry with
R separate clean, dry cloth. Use a different clean area
R on each cloth in each separate instance.

R NOTE: The alcohol must not be allowed to dry on an
R area, as it may leave a film of dirt or oil.

R B. Installation

R (1) Immediately before placing placard on cleaned surface,
R carefully strip protective waxed backing from adhesive
R layer on back of placard.

R NOTE: Hold placard by edges when removing protective
R backing. Avoid placing fingers on adhesive, or
R otherwise contaminating it.

R (2) Examine adhesive layer, especially at its edges, to be
R sure that it is unbroken, smooth, and uncontaminated.

R (3) Place placard in proper position on cleaned area.
R Using plastic wiper, press placard firmly in place by
R working out to each end from the middle. Separately

R and firmly wipe each end and corner down to ensure a
R good bond.

R NOTE: Firm adhesion of all placard edges and corners
R is an absolute necessity in order to achieve
R good service life.

R

STANDARD PRACTICES - SERVICING

R 1. General

R Standard practices pertaining to servicing are contained in this
R section.

APPLICATION OF CORROSION PREVENTIVE MATERIALS - LCP78-11288

1. General

This procedure establishes requirements for the application of corrosion preventive materials, when required. It covers some, but not all, of the materials used for temporary protection during fabrication.

2. Material and Equipment

TT-L-190	Linseed Oil, Boiled, (for Use in Organic Coatings)
P-D-680	Dry Cleaning Solvent
VV-L-800	Lubricating Oil, General Purpose, Preservative, (Water-Displacing, Low Temperature)
MIL-L-6082	Lubricating Oil; Aircraft Reciprocating Engien (Piston)
MIL-C-6529	Corrosion Preventive, Aircraft Engine
MIL-C-11796	Corrosion Preventive Compound, Petrolatum, Hot Application
MIL-C-16173	Corrosion Preventive Compound, Solvent Cutback, Cold-Application
LCP87-1001	Protection of Materials, Parts, and Assemblies in Storage and Manufacture
LCM41-1088	Dry Cleaning Solvent, Non-Photochemically Reactive

3. Preparation and application

A. Preparation

Surfaces to receive corrosion preventive materials must be clean and free of corrosion. When the corrosion preventive being applied is either VV-L-800 Oil or MIL-C-16173, Grade 3 or 5 Compound, the materials may be applied when the surface is still wet, as these corrosion preventive materials are water-displacing films. All other corrosion preventive materials covered by this procedure must be applied to clean, dry surfaces.

R The material must be prepared and applied in accordance with
R Table I.

R The final coating of corrosion preventive compound, after
R drying, must be continuous and uniform, and must provide full
R coverage of the surface to be protected.

R B. Application

R Corrosion preventive materials may be applied by immersion, fill
R and drain, flow coating, slosh and drain, brushing, swabbing,
R wiping, flush and drain, fogging, spraying, injection, packing,
R spreading, or any other suitable method which would provide a
R film or coating conforming to the requirements of this
R procedure. The method of application used may be chosen on the
R basis of the physical consistency of the material and the size
R or configuration of the area or part to be coated.

R When touchup is required, the touchup must be accomplished over
R a properly prepared and cleaned surface, and may be accomplished
R by any application method which will provide adequate coverage
R to the affected area. The materials for touchup must be subject
R to the requirements of Table I.

R When the coating is applied to hollow parts, e.g., tubing, the
R liquid must be applied by forcing it into the hollow member
R under pressure through holes drilled therein, or by immersing
R the part in a bath of the liquid. For a large structure,
R interconnecting holes may be drilled between various members in
R order that the liquid will circulate. Parts that are immersed
R must be manipulated to ensure the absence of air pockets and
R must remain in the bath until all bubbling has ceased. The
R members must be thoroughly drained after treatment and wiped
R free of excess preservative on all exterior surfaces.

R 4. Quality Assurance Provisions

R Sufficient surveillance must be exercised to ensure conformance
R to the requirements of this procedure.

R Uniform and complete coverage is the most important criterion in
R meeting the requirements of this procedure. Whenever heated
R compounds are applied on interior surfaces of parts, the parts
R must be checked for complete inside coverage by noting whether
R or not all areas are heated by the hot preservative compounds.

TABLE I - APPLICATION AND DRYING REQUIREMENTS

Material	Preparation	Application Temp. -°F	Minimum Drying time-hours-to handle
TT-L-190 Linseed Oil	Heat to 225°F minimum before application to drive out all absorbed moisture. (1) (8)	225 minimum	16
MIL-C-6529, Type II, Corrosion Preventive Compound	Prepare by mixing 3 volumes of MIL-L-6082, Grade 1100 Oil with 1 volume of MIL-C-6529, Type I Concentrate (2) (9)	Room	Oily Film (3)
MIL-C-11796 Corrosion Preventive Compound			
Class 1	Use as received	155-200	(5)
Class 1A	Use as received	155-200	(5)
Class 2	Use as received	150-190	(5)
Class 3	Use as received (10)	135-180 (4)	Soft Film (3) (5)
MIL-C-16173 Corrosion Preventive Compound			
Grade 1	Use as received (6)	Room	(4)
Grade 2	Use as received (6)	Room	4 - Soft Film (3)
Grade 3	Use as received (6)	Room	4 - Soft Film (3)
Grade 4	Use as received (6)	Room	4 - (7)
Grade 5	Use as received (6)	Room	4 - Soft Film (3)
VV-L-800 Preservative Lubricating Oil	Use as received	Room	Oil Film (3)

(1) CAUTION: Linseed oil may foam while water is being driven off.

(2) In lieu of mixing, a pre-mixed, ready-to-use material may be used.

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Notes on Table 1 (continued)

(3) These materials do not dry hard and, therefore, require especially careful handling to prevent damage

(4) This material may also be applied by wiping or brushing at room temperature

(5) Parts may be handled as soon as preservative coating reaches room temperature

(6) When this material is applied by dipping or immersion, loss of solvent may occur from the tank by evaporation. Control of the solution by viscosity, specific gravity, or nonvolatile content measurements and addition of P-D-680, Type I, Dry Cleaning Solvent may be required. Keep this material covered when not in use

(7) Tack free in 24 hours maximum

(8) Intended use.- TT-L-190 Linseed Oil is primarily intended for coating the interior of structural steel tubing assemblies

(9) MIL-C-6529, Type II Preservative Compound is primarily intended for use in welded fuel tanks. Since it is compatible with fuel, it does not have to be removed prior to refueling the tanks

(10) In general, corrosion preventive compounds are used where paint type coatings are not suitable; that is, on parts which require adjustment or regular dislocation or breakdown for inspection purposes, or parts which undergo considerable flexure, such as springs

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STANDARD PRACTICES - AIR CONDITIONING

R 1. General

R Standard practices pertaining to the air conditioning system are
R contained in this section.

FLEXIBLE SWAGED COUPLING - REMOVAL AND INSTALLATION

1. General

The flexible swaged coupling (Wig-O-Flex) is used to connect tubes or ducts with simple ferrules on the mating ends. A mating coupling body and a coupling nut are used to contain two O-rings, two split washers, and a one- or two-piece coupling retainer (Ref. Fig. 401). The coupling body and coupling nut slide onto the ducts, over the ferrules, and the split washers are threaded over the ferrules to retain the body and nut on the ducts. The O-rings fit on the ducts between the washers and the retainer, and the retainer holds the duct ends in position. The coupling body and coupling nut are then mated over those components to complete the tube or duct joint.

There are three types of retainers. One consists of two segments which fit together with dovetail joints to form the circular retainer. The second and third types are single piece units, one with a dovetail joint and one with a simple butt joint, that spring apart sufficiently for installation and removal. The two-piece retainer is used on smaller size components and the one-piece on larger sizes.

2. Equipment and Materials

Lock-wire, Fed Spec QQ-W-390, 0.032-inch diameter, or equivalent

O-rings, as called out for particular installation in IPC

R Non-hardening Silicone Lubricant, Viscasil 10000, or equivalent

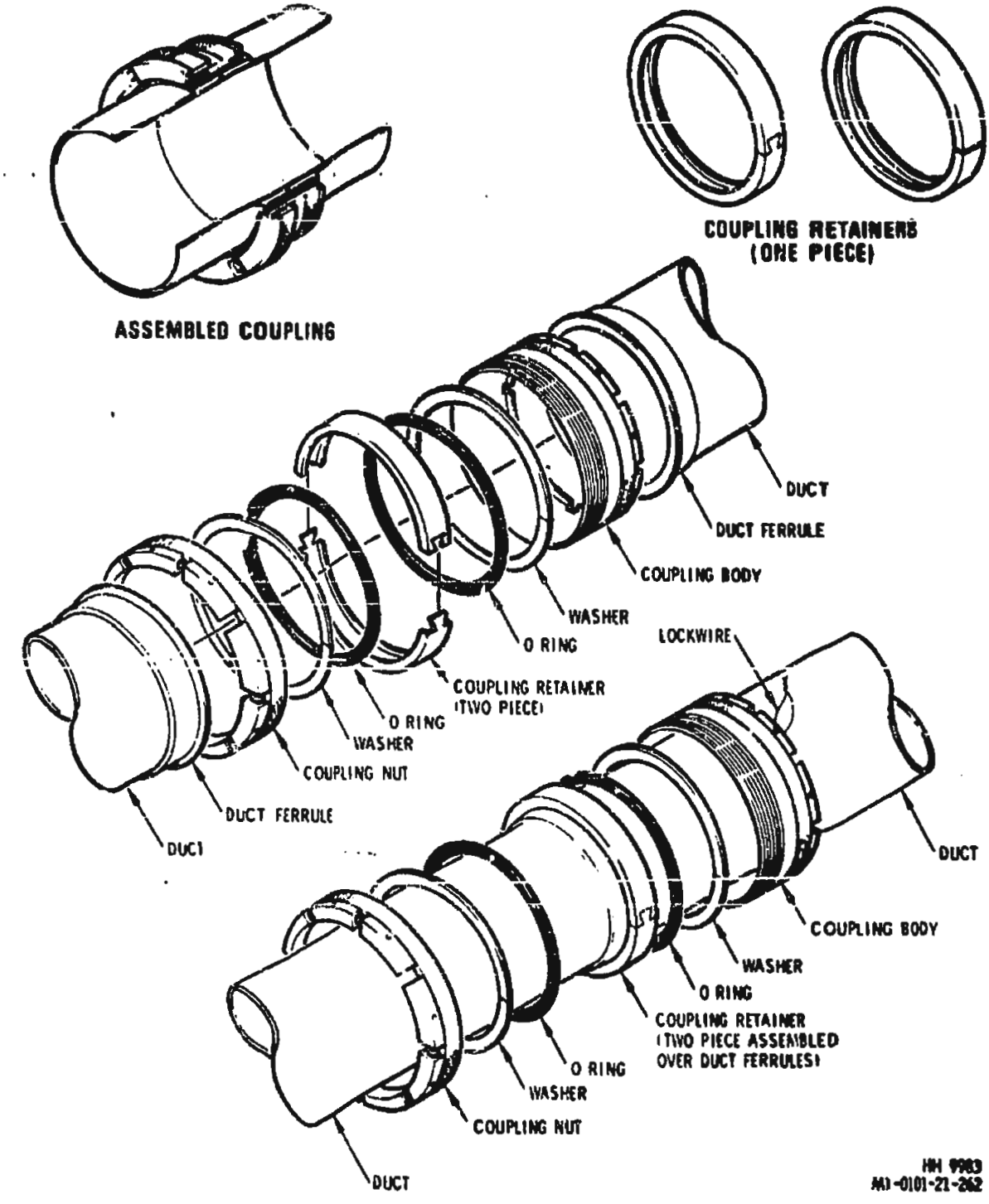
Solvent, Methyl-ethyl-ketone (MEK), or equivalent

3. Removal/Installation

CAUTION: DURING ALL STEPS CARE MUST BE TAKEN TO PREVENT DAMAGE TO SURFACES WHICH CONTACT THE O-RINGS, OR TO COUPLING BODY AND COUPLING NUT THREADS. ANY DAMAGED COMPONENT MUST BE REPLACED.

A. Removal

CAUTION: IF THE NUT AND BODY ASSEMBLY ARE TOO TIGHT TO LOOSEN BY HAND, USE STRAP WRENCHES, PADDED CONNECTOR PLIERS, OR SPANNER WRENCH (NOTCHED BODY AND NUT). DO NOT DAMAGE NUT OR BODY.



Flexible Swaged Coupling - Removal and Installation
Figure 401

(1) Cut lock-wire and unscrew nut assembly from body and slide both parts back onto ducts or component.

NOTE: It may be necessary to remove O-ring from inside coupling nut end of coupling body before body can be moved back.

(2) Slide washers back and remove and discard O-rings.

(3) Remove retainer, using applicable step below:

(a) For two-piece retainer: Open dovetail joints by pressing in on one side of joint while pulling out on other side. Remove retainer halves from duct ferrules.

(b) For dovetail type single-piece retainer: Open dovetail point by pressing in on one side while pulling out on other side. Carefully spring retainer open just enough to twist one end sideways to clear ferrule. Rotate retainer and thread off of ferrule onto duct.

(c) For butt joint type single-piece retainer: Carefully spring retainer open just enough to twist one end sideways to clear ferrule. Rotate retainer and thread off of ferrule onto duct.

NOTE: The coupling is now open for removal of duct or component. After the component has been removed, the retainer should be removed from the other ferrule.

B. Installation

WARNING: OBSERVE ALL SAFETY PRECAUTIONS PERTINENT TO USE OF SOLVENT.

(1) Remove split washers, coupling body, and coupling nut from ducts. Clean coupling body, coupling nut, split washers, retainer, and duct ferrules with solvent and inspect all components for damage. Replace any damaged components.

(2) R R Lubricate internal surface and threads of coupling body and threads of coupling nut with non-hardening silicone lubricant. Thoroughly wipe excess lubricant from exterior (wrenching) surfaces and from inside of coupling nut.

(3) Lubricate split washers and install coupling body and one washer on same duct as before, and coupling nut and other washer on other duct.

(4) Liberally lubricate new O-rings and install over duct ferrules, next to split washers.

(5) If one-piece retainer is used, lightly lubricate retainer and install over one ferrule onto duct.

R (6) Install retainer, using applicable step below:

(a) For two-piece retainer: Lightly lubricate retainer halves, place halves over ferrules, and mate retainer dovetail joints.

(b) For single-piece retainer: Spring retainer just enough to thread over ferrule of both tubes, carefully rotate into position and (if used), mate dovetail joint.

R (7) Slide O-rings and washers into position against the retainer. Check that O-rings are not twisted.

R (8) Slide coupling body over retainer and O-rings.

R (9) Thread coupling nut onto body, align carefully and tighten.

NOTE: Torque is not critical. The values specified in Table 401 will permit estimating the force to be applied with a spanner or strap wrench or by hand.

R (10) Lock-wire nut assembly to body. Position lock-wire to prevent unscrewing of parts.

Torque Values for Use on Swaged Flexible Couplings
Table 401

TUBE SIZE INCHES	O-RING MATERIAL COUPLING TORQUE LB IN.	
	BUNA-N FLUOROCARBON ETHYLENE PROPYLENE	SILICONE
0.25	20-30	20-30
0.38	30-40	30-40

Torque Values for Use on Swaged Flexible Couplings (Cont)
Table 401

TUBE SIZE INCHES	O-RING MATERIAL COUPLING TORQUE LB IN.	
	BUNA-N FLUOROCARBON ETHYLENE PROPYLENE	SILICONE
0.50	40-50	40-50
0.63	50-65	50-60
0.75	60-84	60-108
1.00	84-120	72-120
1.25	120-156	84-132
1.50	180-216	84-132
1.75	204-240	96-144
2.00	240-276	96-144
2.25	246-300	100-150
2.50	288-324	108-156
2.75	324-360	115-160
3.00	360-396	120-168
3.50	432-468	120-168
4.00	504-540	132-180
4.50	576-612	140-200
5.00	648-684	150-210
5.50	720-756	160-220
6.00	792-828	170-230

ELECTROFORM NICKEL DUCTS - APPROVED REPAIRS

1. Approved Repairs

R Repair of electroform nickel ducts in the air conditioning and
R pneumatic systems is accomplished by brazing or resistance welding (where possible).

Requirements and quality standards for electrical resistance spot, roll spot, stitch spot and seam welding, and for brazing copper, steel, nickel, and cobalt base alloys are contained in Lockheed Corporate Process Specifications LCP74-1045A and LCP74-1066A.

DUCT INSULATION - APPROVED REPAIRS

1. General

Repair of air gap type duct insulation on metal ducts is limited to minor repair of insulation covers or cover supports as follows:

Type I - Damaged Cover Support at Duct End

Use of this repair is limited to repair of cover supports at end of duct.

Type II - Torn, Cracked or Dented Cover

Use of this procedure is limited to a maximum defect length of three inches, or a dent of 1/4-inch maximum depth.

Type III - Hole or Large Tears in Cover

Use of this procedure is limited to a 3-inch maximum diameter hole, or a tear of from 3-inches to 12-inches maximum length. Damaged area is also limited to 25% of periphery.

Type IV - Large Damaged Section of Cover

Limited to crushed or otherwise damaged area exceeding 25% of the periphery, dents exceeding 1/4-inch in depth, or tears exceeding 12-inches in length.

2. Equipment and Materials

Repair Kit, RP 400588-103, Arrowhead Products Division, Federal-Mogul Corp.

3. Approved Repairs

Repair materials and detailed procedures are contained in Repair Kit RP 400588-103, Arrowhead Products Division, Federal-Mogul Corp., 4411 Katella Avenue, Los Alamitos, Calif. 90720.

R # HEAT RESISTANT SEALING OF AIR DUCTS - MAINTENANCE PRACTICES

R 1. General

R This procedure contains the requirements for sealing joints in duct sections, thermal deicer attachments, and other areas of hot air ducts which require heat resistant sealing. This applies to sealing of air duct joints which will have a maximum intermittent temperature of 350 degrees Fahrenheit (177 degrees Celsius) and a maximum continuous temperature of 325 degrees Fahrenheit (163 degrees Celsius) and at a maximum pressure of 5 PSI.

R 2. Equipment and Materials

R 1,1,1, Trichloroethane, MIL-T-81533, or equivalent.

R Methyl-Ethyl-Ketone, Fed. Spec TT-M-261, or equivalent.

R Naphtha, Alphatic, Fed. Spec. TT-N-95, or equivalent.

R Tape, Fiberglass Adhesive Backed, MIL-T-4053, or equivalent.

R Silicone Rubber Sheet, Glass Fabric Reinforced, 0.010 inch thick, AMS 3515, or equivalent.

R Asbestos Cloth, Gasket Material, Lockheed Part No. LCM 21-1263.

R Adhesive, One Part, Room Temperature Vulcanizing, Lockheed Part No. LCM 30-2085.

R Cleaner, Petroleum Base, For Primed Metals, Non-photochemically Reactive, Lockheed Part No. LCM 32-1087.

R Clamp, Aircraft Hose, AN 737, Lockheed Part No. LS 9753, or equivalent.

R Cloths, Clean lint-free.

R 3. Referenced Procedures

R 20-51-15 Application of Adhesives - Maintenance Practices

R 4. Maintenance Practices

R NOTE: Sealing may be accomplished at any convenient stage of assembly.

R A. Non flanged Duct Joints

R WARNING: USE SOLVENTS IN WELL VENTILATED AREA. AVOID FLUID
R CONTACT WITH SKIN AND EYES. PROLONGED EXPOSURE
R MAY RESULT IN SKIN OR EYE IRRITATION. KEEP AWAY
R FROM HEAT, SPARKS AND OPEN FLAME. FAILURE TO
R COMPLY MAY RESULT IN MATERIAL COMBUSTION.

R (1) Clean all exterior surfaces of both ducts at least four
R inches from joint. Use cloths moistened with one of
R the following: 1,1,1, Trichloroethane, Alphatic
R Naphtha or LCM 32-1087 Cleaner.

R (2) Wipe surface dry with clean cloths before solvent
R evaporates.

R (3) Verify surface is dry and free of grease, oil or other
R foreign material.

R (4) Apply two complete wraps of 0.010 inch thick AMS 3315
R silicon rubber sheet directly over the joint.

R (5) Apply a brush coat of LCM 30-2085 Adhesive over rubber
R sheet (Ref. 20-51-15).

R (6) Spiral Wrap MIL-T-4053 fiberglass tape so that it will
R extend three inches on each side of joint, then lap the
R tape to obtain three to four layers of tape over the
R joint. The tape must follow all irregularities in the
R duct.

R (7) If assembly permits, cure tape at 180 to 200 degrees
R Fahrenheit (82 to 93 degrees Celsius) for 30 to 45
R minutes.

R NOTE: The tape is a vulcanizing type. Joints in hot
R air ducts will gradually self cure in operation.

R (8) Install an AN737TW or LS9753 duct clamp over wrapped
R tape approximately one inch from each edge. If
R installation of clamps is impossible, brush coat
R LCM30-2085 Adhesive over complete wrap (Ref. 20-51-15).

R B. Flanged Duct Joints

R WARNING: USE SOLVENTS IN WELL VENTILATED AREA. AVOID FLUID
R CONTACT WITH SKIN AND EYES. PROLONGED EXPOSURE
R MAY RESULT IN SKIN OR EYE IRRITATION. KEEP AWAY
R FROM HEAT, SPARKS AND OPEN FLAME. FAILURE TO
R COMPLY MAY RESULT IN MATERIAL COMBUSTION.

R (1) Clean flanges and surrounding areas. Use cloths moistened with one of the following: 1,1,1, Trichloroethane, Alphatic Naphtha or LCM 32-1087 Cleaner.

R (2) Wipe surface dry with clean cloths before solvent evaporates.

R (3) Verify surface is dry and free of grease, oil or other foreign material.

R WARNING: AVOID BREATHING ASBESTOS DUST OR FIBERS. USE FILTERED EXHAUST BOOTHS AND VACUUMS WHEN POSSIBLE. VACUUM UP WASTE AND DEBRIS DURING AND AFTER MANUFACTURE OF GASKET. IF VACUUM IS UNAVAILABLE USE RESPIRATORY PROTECTION. SEAL AND PROPERLY DISPOSE OF ALL ASBESTOS WASTES.

R (4) Cut an asbestos cloth gasket from LCM21-1263 Gasket Material to fit the flange.

R (5) Cement the gasket to one flange with LCM30-2085 adhesive (Ref. 20-51-15).

R (6) Apply a brush coat of LCM 30-2085 adhesive to other flange and remaining face of gasket.

R (7) Assemble duct.

R WARNING: USE M.E.K. IN WELL VENTILATED AREA. AVOID FLUID CONTACT WITH SKIN AND EYES. PROLONGED EXPOSURE MAY RESULT IN SKIN OR EYE IRRITATION. KEEP AWAY FROM HEAT, SPARKS AND OPEN FLAME. FAILURE TO COMPLY MAY RESULT IN MATERIAL COMBUSTION.

R (8) Remove excess LCM30-2085 adhesive from outside of seam with a cloth moistened with Methyl-Ethyl-Ketone.

INSTALLATION OF L-1011 ECS DUCT AND WATER LINE INSULATION - PD71-4578

1. SCOPE

1.1 This Process Bulletin establishes the required materials and fabrication procedures for installing fiberglass insulation on ducts used in the environmental control system (ECS), and where required on water or waste water lines, for the Model L-1011.

2. APPLICABLE DOCUMENTS

2.1 SPECIFICATIONS

Federal

MIL-B-5924	Batting, Insulation, Glass Fibers

Lockheed

C-22-1254	Covering, Insulation Blanket
LCM30-2084	Cement, General Purpose, Chloroprene

2.2 The following commercial materials, covered by the Engineering Purchasing Specifications (EPS) Manual, form a part of this bulletin to the extent specified herein:

Description	EPS Number
Pressure Sensitive Tedlar Tape	24.1510

3. REQUIREMENTS

3.1 Materials

3.1.1 Materials referred to in this Process Bulletin shall conform to the requirements of the applicable specifications listed herein except as otherwise specified on the Engineering drawing.

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3.1.2 The Fiberglass batt insulation shall conform to MIL-B-5924, Type I. Thickness shall be in accordance with the Engineering drawing.

3.1.3 The covering over the fiberglass batting shall be flexible, metallized, polyvinyl fluoride (Tedlar) film, conforming to C-22-1254 of the type specified on the Engineering drawing. The covering is commonly referred to as PVF film.

3.2 Fabrication and installation

3.2.1 General

3.2.1.1 Joining and sealing of the flexible covering material shall be accomplished wherever possible without the use of cement. Seams or seals shall be heat sealed wherever possible. Holes, cutouts, slits, etc., shall be sealed preferably by heat sealing but may be sealed by cementing.

3.2.1.2 The covering material shall cover the fiberglass batt insulation as snugly as possible without appreciably compressing it.

3.2.1.3 After sealing, the excess covering material shall be trimmed so that it does not extend more than 3/8 inch from the seal or bond line.

3.2.1.4 Surfaces to be heat sealed or cemented, must be clean and free from oil, grease, water, solvents and other contamination.

3.2.1.5 Width of seal. - Width of a heat seal shall be a minimum of 1/8 inch. Width of a cemented seal shall be between 3/8 and 3/4 inch.

3.2.1.6 Heat sealing covering material

3.2.1.6.1 If the covering material is heat sealable on only one side, care must be taken during the heat sealing procedure to mate the same sides in order to obtain the strongest bond.

3.2.1.6.2 Recommended equipment. - The following equipment can be used to produce satisfactory heat seals:

(a) Thermal Impulse Sealer

(b) Hand Irons

3.2.1.7 Cementing covering material

3.2.1.7.1 A thin, uniform coat of cement, LCM30-2084, shall be applied to both surfaces to be bonded. Allow thin coat to air dry until it is tacky to the touch. Then join the surfaces.

3.2.1.7.2 Cure of the adhesive may be accelerated by heating with a heat gun. Do not scorch the material.

3.2.1.7.3 Complete cure will occur within 48 hours at room temperature.

3.2.2 Detailed procedure, ECS ducts

3.2.2.1 Cut the fiberglass batt to the size and shape indicated by the duct drawing. If the insulation is to go all the way around the duct, it shall be cut so that it forms a longitudinal butt joint with itself.

3.2.2.2 Daub a spot (about 1-1/2 inch in diameter) of cement, LCM30-2084, on the outside surface of the duct every four to six inches lengthwise and circumferentially. On those areas where the insulation forms butt joints, i.e., longitudinal seams, T- and Y-joints, use additional adhesive as required to keep the insulation from peeling back during handling.

3.2.2.3 Allow the adhesive to dry until it is quite tacky.

3.2.2.4 Apply the insulation to the duct as shown on the drawing. Press it down firmly in the areas of the butt joints to form a good bond with the duct surface.

3.2.2.5 Ducts that have helical stiffeners bonded on the outside surface shall have the insulation laid over the top of the stiffener to entirely cover the duct.

3.2.2.6 Cut the covering material to the same shape as the insulation. Allow an excess of about 1-1/2 inch of material all around.

3.2.2.7 Apply a thin coat of adhesive to those areas of the duct where the covering is to be bonded to the duct. Allow the adhesive to air dry until it becomes quite tacky.

3.2.2.8 Position the covering over the insulation and bond it into place as shown on the drawing.

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3.2.2.9 Heat seal or bond the edges of the covering wherever they come together, i.e., longitudinal seams, T- and Y-joints, observing the general requirements in 3.2.1.

3.2.2.10 Vent holes. - The PVF covering over the fiberglass insulation batt shall be perforated with a sharp instrument leaving a hole 3/32 to 3/16 inch in diameter to act as a vent for cabin pressure changes. There shall be one vent hole for each 3 to 5 square feet of duct covering surface area. There shall be at least one hole in any duct covering.

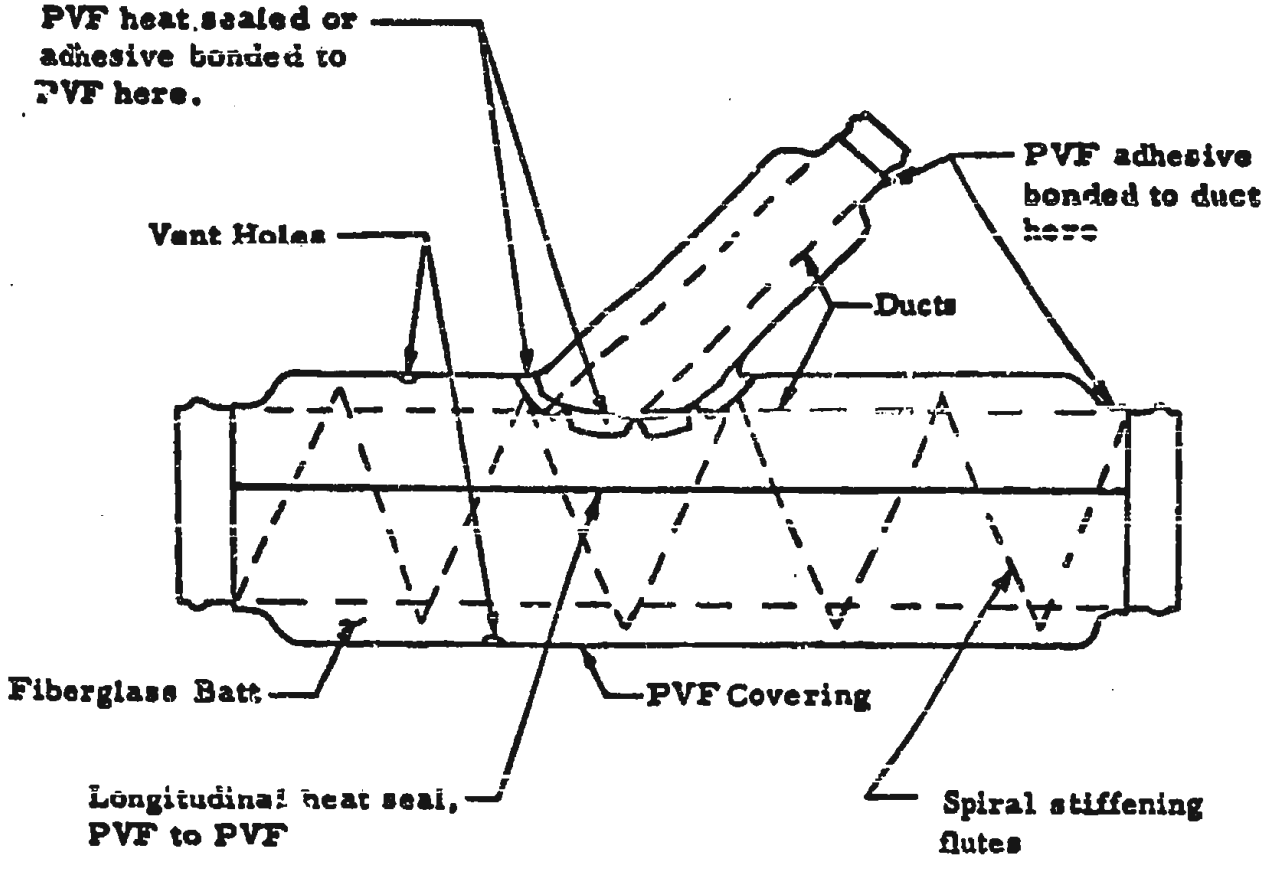

FIGURE 1 - EXAMPLE OF INSULATION ON DUCT

3.2.3 Detailed procedure - water lines

3.2.3.1 Cut the fiberglass batt to the size and shape required. The batt should be of a size such that it will make a butt joint with itself when wrapped around the water line or lines.

M1-0100-20-572

3.2.3.2 Cut the PVF (Tedlar) covering material to the size and shape required. Allow a proper excess on edges for sealing, and particularly on the edge that will form the flap which will be used to effect a sealing surface when the covered batt is wrapped around the water line.

3.2.3.3 Lay the fiberglass batt between two sheets (or one sheet folded over) of the PVF (Tedlar) covering. The heat sealable surfaces of the covering shall face the insulation. Seal the edges of the PVF covering as required, observing the general requirements of 3.2.1. Heat sealing is the preferred method. An example of covered insulation material is shown in Figure 2.

3.2.3.4 Holes, slits, or cutouts in the fiberglass batt shall have their edges covered or sealed. PVF (Tedlar) covering material C-22-1250, or Tedlar pressure sensitive tape EPS 24.1510 may be used to seal these openings.

3.2.3.5 Wrap the covered insulation batt around the water line as required. Where several water lines are close together both lines may be enclosed within one insulation batt. Care shall be taken to properly fit the covering over the electrical heating tape wrapping on the lines, and around brackets or clamps. The insulation batt shall make a butt joint with itself where it laps around the water line, with the sealing flap extending over the butted edges. See Figure 3 for a general example. The flap shall be sealed to the cover to complete the closure. Heat sealing is preferred. If cement sealing is used, the flap must be held firmly in contact with the covering a minimum of six hours until the cement takes its initial cure.

3.2.3.6 Successive insulation batts should butt together at the ends to provide minimum gap. The batt joint between batts shall be closed using pressure sensitive Tedlar tape EPS 24.1510. See Figure 3 for an example.

3.2.3.7 Vent holes. - The outer PVF covering over the fiberglass insulation batt shall be perforated with a sharp instrument leaving a hole 3/32 to 3/16 inch in diameter to act as a vent for cabin pressure changes. The hole shall be located on the bottom side of the wrapping, and shall be spaced at approximately 20 inch intervals. There shall be at least one hole in each batt.

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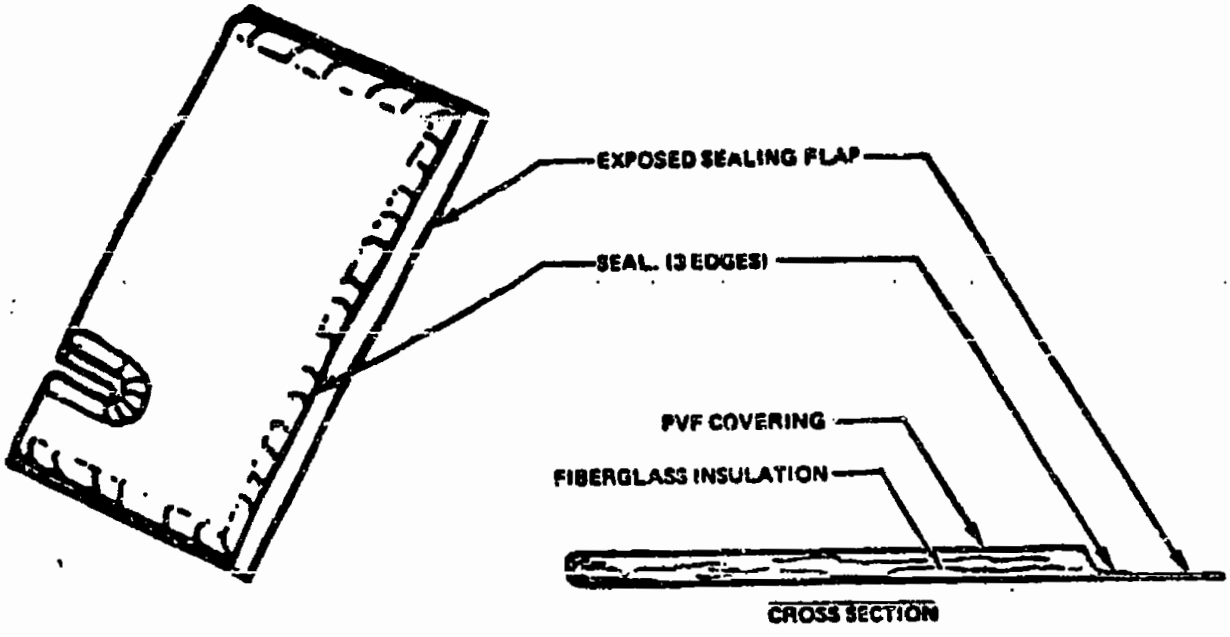


FIGURE 2 - COVERED INSULATION BATT

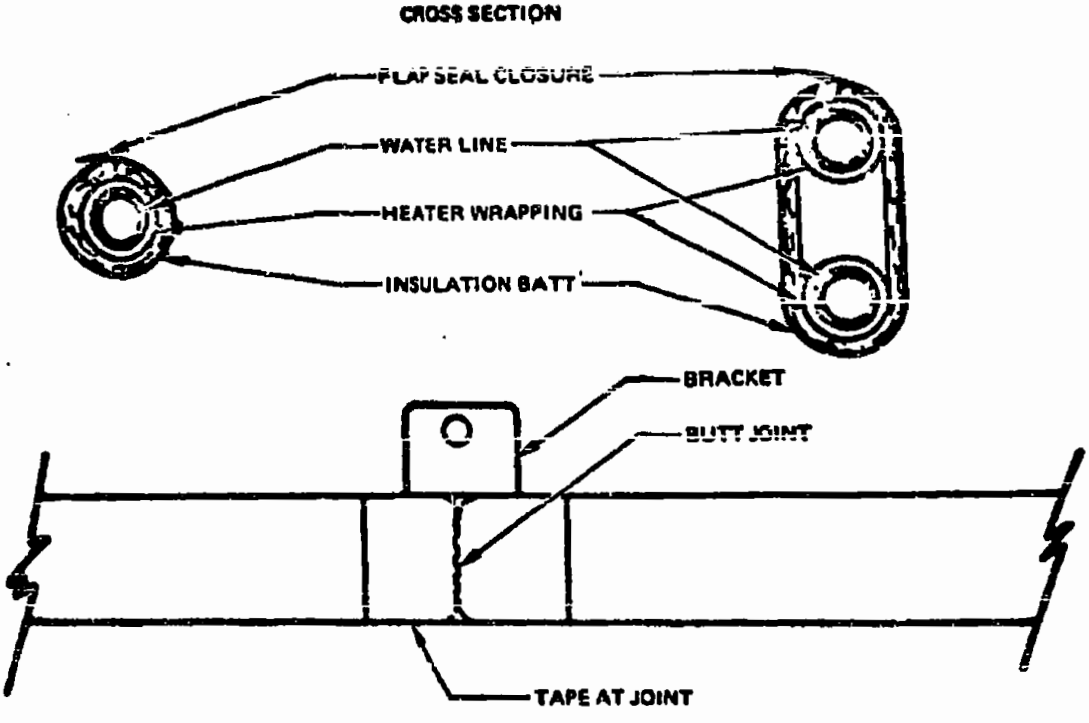


FIGURE 3 - BATTING INSTALLATION

MI-0100-20-574

4. QUALITY ASSURANCE PROVISIONS

4.1 Assemblies and material shall be inspected for conformance to the Engineering drawings and to the requirements of this bulletin.

5. PREPARATION FOR DELIVERY

5.1 When applicable, the finished products shall be packaged in such a way that damage is prevented during shipment.

6. NOTES

6.1 There is no Government specification covering the requirements of this bulletin.

6.2 This revision supersedes PB71-457A, dated 5-2-70.

FIBERGLASS DUCT - APPROVED REPAIRS

1. General

Low pressure fiberglass laminated air ducts with maximum operating temperature of 250 degrees F (121 degrees C) can be repaired for minor breaks, tears and other damage.

2. Equipment and Materials

R Glass fabric, Style 181, MIL-C-9084, Type VIII, Class 1 or
R equivalent.

R Liquid Bonding Resin, LCM22-1048, Type 1 or equivalent.

Internal duct shop aid, to support lay-up of repair splice until cured, with parting agent on O.D.

R 1,1,1, - Trichloroethane, MIL-T-81533 or equivalent.

R No. 320 Abrasive paper No. 320 wet or dry.

Parting Agent, Film (PVA) 0.003 inch thick or equivalent - Reynolds Metal Co., Monosol Div. of Chris Craft Industries

R Transparent vinyl, polyvinyl alcohol (PVA) or lacquered
R cellophane sheet.

3. Approved Repairs

A. Procedure

R WARNING: TRICHLOROETHANE IS TOXIC. USE IN A WELL
R VENTILATED AREA FREE FROM SPARKS, FLAME, OR HOT
R SURFACES. WEAR GOGLES, SOLVENT-RESISTANT GLOVES,
R AND OTHER PROTECTIVE GEAR. IN CASE OF EYE
R CONTACT, FLUSH WITH WATER AND SEEK MEDICAL
R ATTENTION. IN CASE OF SKIN CONTACT, WASH WITH
R SOAP AND WATER.

(1) Wipe damaged area with 1,1,1, - Trichlorethane and at least one inch of adjacent duct exterior surface all around defect.

(2) Smooth up tears, breaks or cracks, using No. 320 wet or dry abrasive paper.

(3) Lay-up double of the same thickness as the duct, (2-ply minimum), using materials listed above, and internal shop aid as necessary, to provide a minimum overlap of one inch all around defect. Wrap in overlapping layers of one inch wide by 0.003 inch thick PVA tension tape.

(4) For ducts inside the pressurized fuselage, cure for three days at 65 to 90 degrees F (32 degrees C) or for
R two hours at 140-160 degrees F (64-68 degrees C). For ducts in the unpressurized area, cure for one hour at 250 degrees F (121 degrees C).

(5) Remove shop aid from inside and PVA tape from outside.

R B. Procedure for installing missing internal surface
R reinforcement tape at ends of ECS bay air ducts (Ref.
R SB21-200).

R (1) Preparation

R (a) If duct is cracked, smooth up damaged area using
R No. 320 wet or dry paper.

R WARNING: TRICHLOROETHANE IS TOXIC. USE IN A WELL
R VENTILATED AREA FREE FROM SPARKS, FLAME, OR
R HOT SURFACES. WEAR GOGGLES,
R SOLVENT-RESISTANT GLOVES, AND OTHER
R PROTECTIVE GEAR. IN CASE OF EYE CONTACT,
R FLUSH WITH WATER AND SEEK MEDICAL ATTENTION.
R IN CASE OF SKIN CONTACT, WASH WITH SOAP AND
R WATER.

R (b) Wipe damaged area and entire inner surface of duct
R for a distance of 2 inches from the duct opening.

R (c) Cut 5 strips of glass fabric 1.5 inch wide and
R long enough to cover internal surface at end of
R duct.

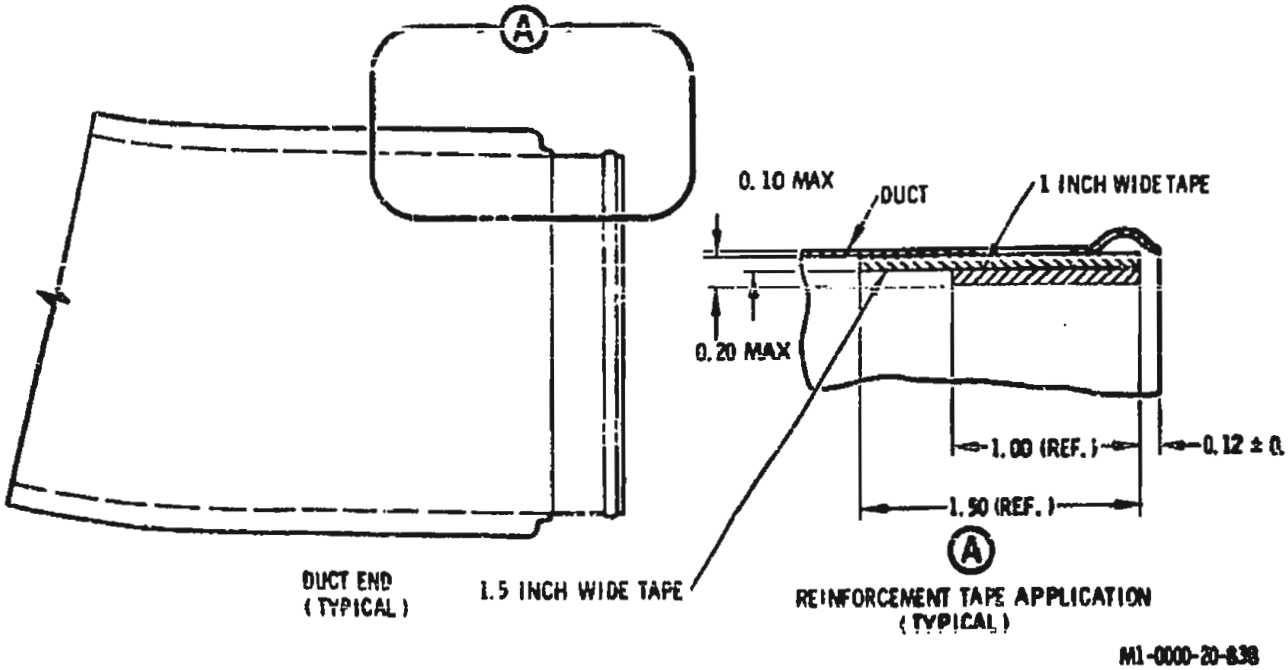
R (d) Impregnate each ply of fabric with liquid bonding
R resin and lay it in position (Ref. Fig. 801).
R Place a sheet of polyvinyl alcohol (PVA) on top of
R impregnated fabric cloth and work out air bubbles.
R Repeat process with each successive ply making
R sure that total contact is obtained between
R surfaces.

R (e) Cut 5 strips of glass fabric 1 inch wide as in
R Step (c), and install over the 1.5 inch wide cloth
R as noted in Step (d) and shown in Figure 801.

(f) Insert internal duct shop aid to support glass fabric lay-up while curing the reworked area.

(g) Cure reworked area as noted in Step 3A(4).

(h) Remove shop aid and PVA tape.



R Water Separator Ducting End Reinforement
R Figure 801

STANDARD PRACTICES - COMMUNICATIONS

R 1. General

R Standard practices pertaining to the communication systems are
R contained in this section.

ELECTRONIC EQUIPMENT RACK FRONT HOLDDOWN EXTRACTOR MAINTENANCE PRACTICES

1. General

The front holddown extractor (Ref. Fig. 201) applies force to engage and disengage electronic equipment with large rear connectors having high-density pin arrangements. In addition, a holddown hook engaging mechanism provides the function of equipment holddown.

The fluted knob has a protruding center indicator with a red band around it; when the equipment is under tension, the red band is not visible. When the red band is visible, the equipment is disengaged or not under tension.

2. Maintenance Practices

A. Equipment Removal

(1) Turn fluted knob on front holddown extractor counterclockwise until red indicator is completely visible (Ref. Fig. 201, View A). Continued turning of knob provides extracting force to equipment to be removed.

(2) Turn holddown hook engaging mechanism counterclockwise against stop.

(3) Lower extractor so equipment in rack can be removed without interference.

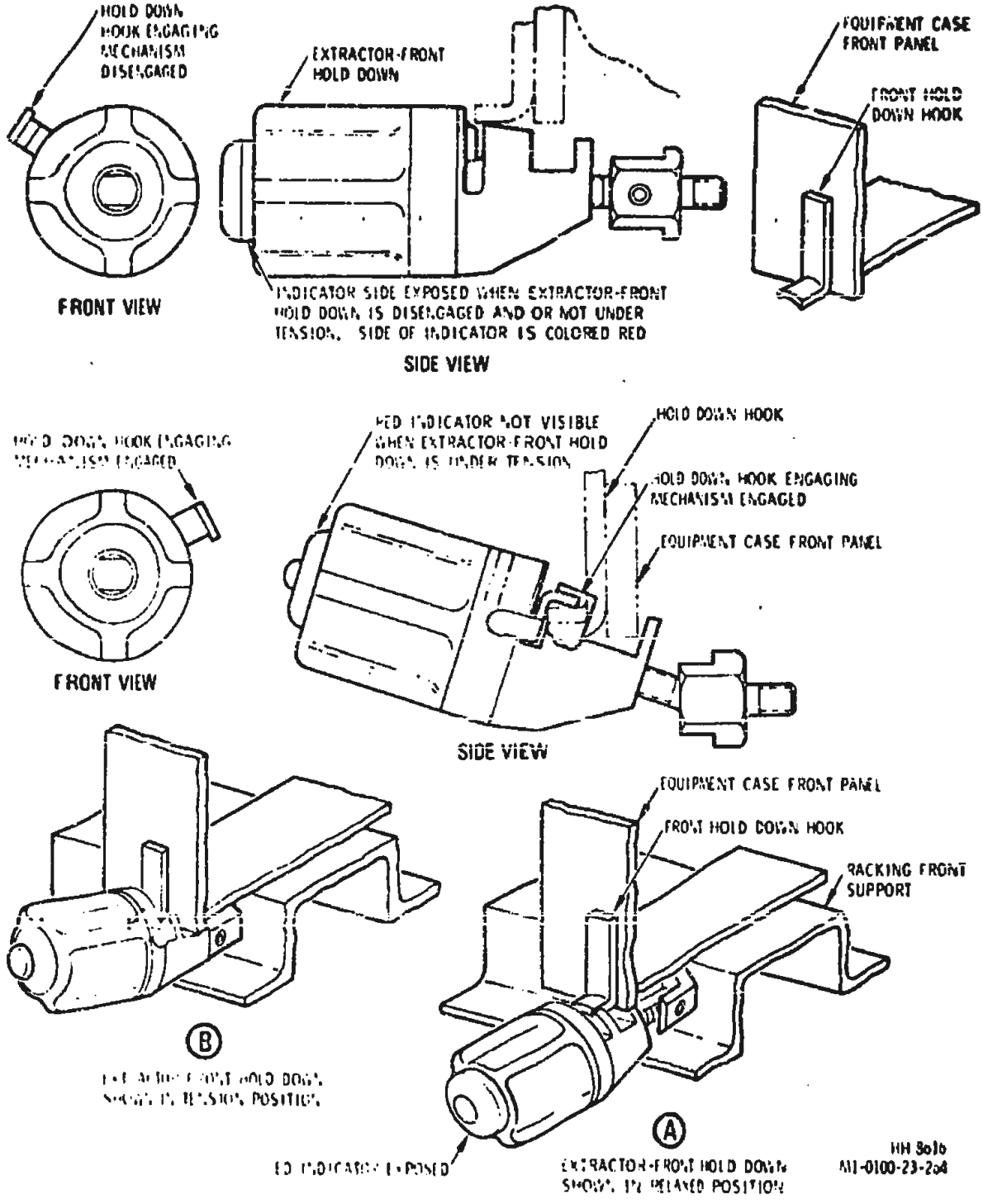
B. Equipment Installation

(1) Turn fluted knob on front holddown extractor counterclockwise against stop. Turn holddown hook engaging mechanism counterclockwise against stop.

(2) Lift extractor to engage equipment front holddown hook. Turn holddown hook engaging mechanism clockwise against stop. Verify that holddown hook is engaged (Ref. Fig. 201, View B).

R CAUTION: DO NOT USE TOOLS TO TURN FLUTED KNOBS. FLUTED
R KNOBS MUST BE HAND TIGHTENED.

(3) Turn extractor fluted knob clockwise until red indicator disappears into end of fluted knob. This indicates equipment is properly held in rack.


HOLD DOWN HOOK ENGAGING MECHANISM DISENGAGED
EXTRACTOR-FRONT HOLD DOWN
EQUIPMENT CASE FRONT PANEL
FRONT HOLD DOWN HOOK
FRONT VIEW
INDICATOR SIDE EXPOSED WHEN EXTRACTOR-FRONT HOLD DOWN IS DISENGAGED AND OR NOT UNDER TENSION. SIDE OF INDICATOR IS COLORED RED
SIDE VIEW
HOLD DOWN HOOK ENGAGING MECHANISM ENGAGED
FRONT VIEW
RED INDICATOR NOT VISIBLE WHEN EXTRACTOR-FRONT HOLD DOWN IS UNDER TENSION
HOLD DOWN HOOK
HOLD DOWN HOOK ENGAGING MECHANISM ENGAGED
EQUIPMENT CASE FRONT PANEL
SIDE VIEW
EQUIPMENT CASE FRONT PANEL
FRONT HOLD DOWN HOOK
RACKING FRONT SUPPORT
(B)
(A)
HH 3olb
AII-0100-23-2o4

R R Electronic Equipment Rack Front Holddown Extractor
Figure 201

RACK-MOUNTED ARINC BOX LEVER LATCH - MAINTENANCE PRACTICES

1. Equipment and Materials

   Chatillon Spring Gage, 0.8 pound, or equivalent

2. Lever Latch Adjustment

   CAUTION: CORRECT ADJUSTMENT OF THE FORK ASSEMBLY IS NECESSARY TO ENSURE FULL ENGAGEMENT OF CONNECTORS AND SECURE INSTALLATION OF UNIT IN RACK.

   A. Before installing electronic unit (Ref. Table 201), loosen locknut on fork assembly (Ref. Fig. 201).

   B. Adjust fork assembly as necessary to obtain dimension A ±0.03 in.

   C. Tighten locknut finger-tight.

   D. Install electronic unit in rack, and engage lever latch hook with pin in fork assembly.

   E. Close lever latch until full connector engagement is obtained.

      NOTE: It is possible to determine full connector engagement by feel. A sudden increase in resistance to handle movement usually indicates that the connectors are fully engaged.

   F. Use force indicator to measure force at required at point B to fully close and latch lever latch in handle. Force shall be between 19 and 23 pounds. If necessary, readjust fork assembly (± one-half turn).

      NOTE: One-half turn of fork assembly is equal to 0.015 inch.

   G. Tighten locknut after adjustment is completed.

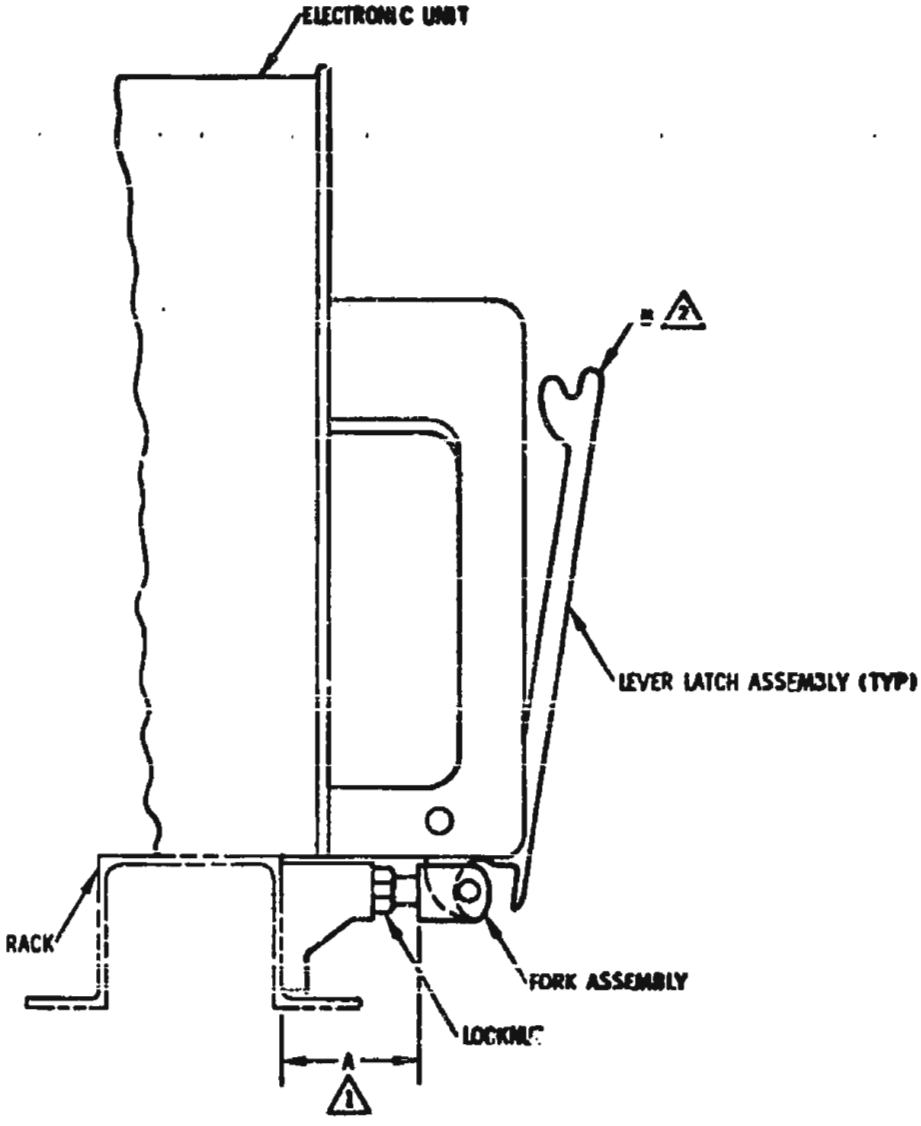
      NOTE: Locknut can be tightened without removing unit from rack.

Rack Mounted Electronic Unit Locations And Adjustment Data
Table 201

LOCATION	SHELF	NOMENCLATURE	DIMENSION A (INCHES) (REF. FIG. 1)	MAINTENANCE MANUAL REF
FESC AIDS RACK	UPPER	DATA ACQUISITION UNIT	1.26	31-32-03
FESC AIDS RACK	CENTER	CENTRAL ELECTRONICS UNIT	1.26	31-32-01
FESC AIDS RACK	CENTER	CONTINUOUS LOOP RECORDER	1.26	31-32-05
FESC AIDS RACK	LOWER	INCREMENTAL RECORDER	1.27	31-32-04
FESC RH RACK	ALL	TRANSFORMER-RECTIFIER	1.75	24-31-01
FESC RH RACK	LOWER	WINDSHIELD HEAT CONTROLLER	1.82	30-41-01
MESC LH RACK	UPPER	MULTIPLEXER POWER UNIT	1.60	23-33-08
MESC LH RACK	UPPER	BATTERY CHARGER	1.73	24-32-04
MESC LH RACK	CENTER	GENERATOR CONTROL UNIT	1.67	24-21-05
MESC LH RACK	LOWER	APU GEN CONTROL UNIT	1.67	24-21-05
MESC LH RACK	LOWER	BUS PROTECTION PANEL	1.67	24-20-03
MESC LH RACK	LOWER	MAIN MULTIPLEXER	1.82	23-33-02
MESC RH RACK	UPPER	DATA ACQUISITION UNIT	1.26	31-32-03
MESC RH RACK	UPPER	GENERATOR CONTROL UNIT	1.67	24-21-05

Rack Mounted Electronic Unit Locations And Adjustment Data (Cont)
Table 201

LOCATION	SHELF	NOMENCLATURE	DIMENSION A (INCHES) (REF. FIG. 1)	MAINTENANCE MANUAL REF
MESC RH RACK	LOWER	GENERATOR CONTROL UNIT	1.67	24-21-05



NOTE

1. THE DIFFERENCE IN APPLIED FORCE DUE TO THE DIFFERENT HANDLE LENGTHS IS COMPENSATED FOR BY DIMENSION A. REFER TO TABLE 201 FOR DIMENSION A
2. APPLY LATCHING FORCE AT END OF LEVER LATCH HANDLE. MEASURE LATCHING FORCE AT POINT B

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R
R

Lever Latch Adjustment
Figure 201

STANDARD PRACTICES - ELECTRICAL POWER

R 1. General

R Standard practices pertaining to the elctrical power systems are
R contained in this section.

MISCELLANEOUS ELECTRICAL COMPONENTS REMOVAL AND INSTALLATION

1. General

Removal and installation instructions for components of the electrical system requiring special attention are outlined in procedural steps, to enable the job to be done easily and efficiently.

Removal and installation instructions are not given for components that are secured in position with standard bolts or screws, or secured in a mount assembly with knurled nuts. Some connectors and/or terminals need to be disconnected before removal, while other components have an electrical connector that is an integral part of the component. These connectors are usually found on components that are installed on the mount. Whenever electrical equipment is removed, the receptacle and the plug of the connector should be protected by installing protective caps.

When replacing defective equipment, use equipment that has an identical part number, unless substitute equipment has been authorized. After installation of serviceable equipment, adjustment and tests should be conducted to ensure that the applicable system is operating properly.

A typical removal and installation procedure for rack-mounted components and a relay follows.

2. Referenced Procedure

24-00-00 Electrical Power - Maintenance Practices

3. Removal/Installation

A. Removal - Rack-mounted Components

(1) Disconnect electrical power from component to be removed by opening and tagging appropriate circuit breaker(s).

R WARNING: WHEN WORKING IN AREAS WHERE HIGH VOLTAGES ARE
R NORMALLY PRESENT, REMOVE ALL POWER FROM AIRCRAFT
R ELECTRICAL SYSTEM (REF. 24-00-00).

(2) Gain access to component to be removed.

(3) Disconnect electrical connectors; cap connectors and receptacles.

(4) Loosen knurled nuts on holddown connectors.

(5) Disengage holddown connectors from mounting brackets.

(6) Remove unit from mount.

CAUTION: DO NOT RAISE COMPONENT UNTIL FREE FROM CONNECTOR.

B. Installation - Rack-mounted Components

CR NOTE: Many of the electrical/electronic units are retained in their respective racks with a lever latched hook engaged on an adjustable fork assembly on the rack, reference Figure 401. Correct adjustment of the fork assembly is necessary to insure full engagement of connectors and secure installation of the unit in the rack and should be verified each time a unit is installed because of the permissible tolerances of the box length and hook construction. It is possible to determine full connector engagement by feel. A sudden increase in handle pressure usually indicates that the connectors are fully engaged unless obstructed by a foreign body or other interference. The force required on the lever to fully close and latch the lever latch shall be between 19 and 23 pounds. If necessary to readjust fork assembly to obtain required latching force, loosen locknut, rotate fork assembly ± one-half turn and re-check latching force. Tighten locknut after completion of proper adjustments.

(1) Ensure that system is deenergized [Step 3A(1)].

(2) Place component on mount and slide in to mate electrical connector with receptacle.

NOTE: Do not raise component. Ensure that electrical connector is properly mated with receptacle.

(3) Engage and tighten holddown connectors.

(4) Uncap and connect electrical connectors to receptacles on unit. (Not applicable to units having integral electrical connectors.)

(5) Replace parts or components removed to gain access to units.

(6) Remove tag(s) and close circuit breaker(s) opened in Step 3A(1).

(7) Follow applicable system adjustment and test procedures to ensure that component is functioning properly.

C. Removal - Relay

(1) Disconnect electrical power from relay to be removed by opening and tagging appropriate circuit breaker(s).

WARNING: WHEN WORKING IN AREAS WHERE HIGH VOLTAGES ARE NORMALLY PRESENT, REMOVE ALL POWER FROM AIRCRAFT ELECTRICAL SYSTEM (REF. 24-00-00).

(2) Gain access to relay.

(3) Tag and disconnect wires.

(4) Support relay while removing mounting screws and remove relay.

D. Installation - Relay

NOTE: Ensure that system is deenergized [Step 3C(1)].

(1) Place relay in proper position.

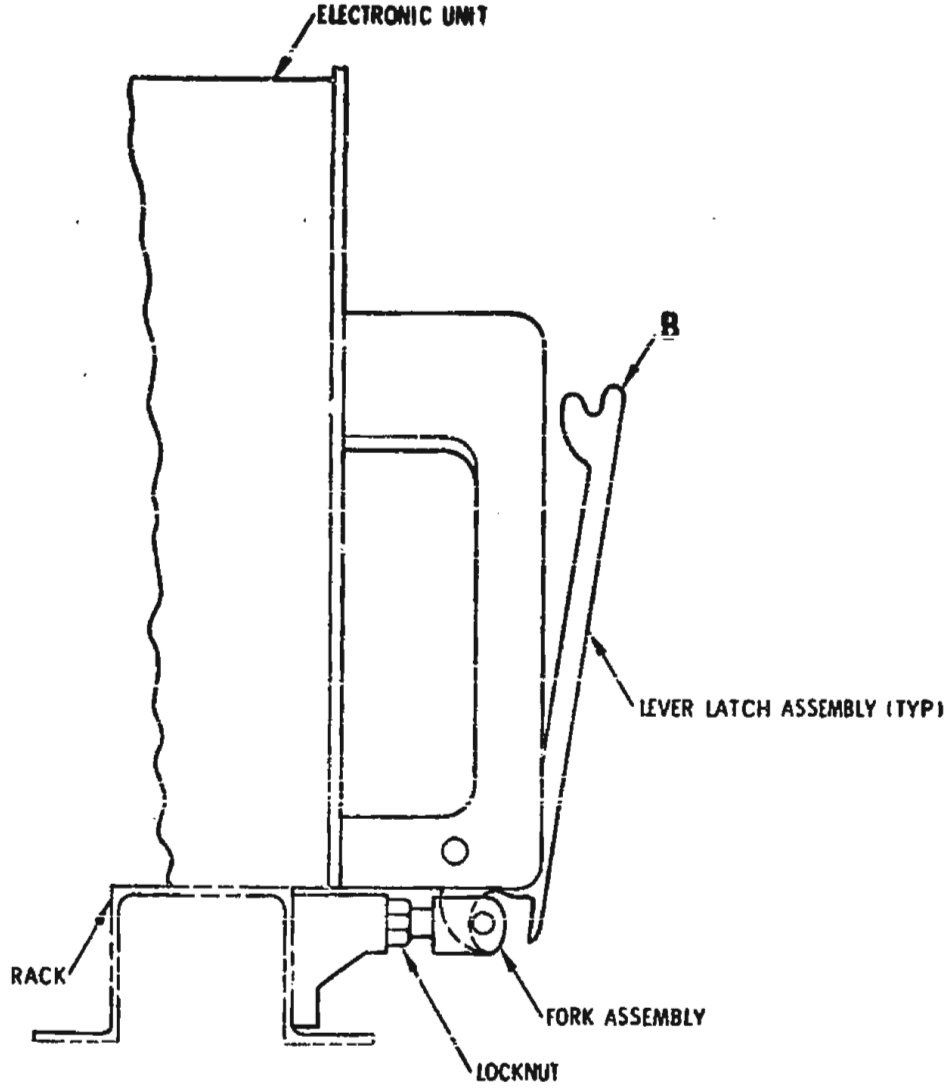
(2) Install and tighten mounting screws.

(3) Connect wires to relay. Ensure that leads are on correct terminals.

(4) Remove tag(s) and close circuit breaker(s) opened in Step 3C(3).

(5) Replace any parts or components which were removed to gain access to relay.

(6) Follow applicable system adjustment and test procedures to ensure that relay is functioning properly.



NOTE

MEASURE LATCHING FORCE AT POINT **B**

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CR
CR

Lever Latch Adjustment
Figure 401

R
R
0018

EFFECTIVITY: ALL

R CRIMPED ELECTRICAL CONTACT - REMOVAL AND INSTALLATION

R 1. General

R Wires terminating with crimped contacts are inserted into, and
R removed from, certain types of electrical connectors,
R switchlights, remotely controlled circuit breakers, and terminal
R junctions by using methods and equipment described herein.

R 2. Equipment and Materials

R Contact Removal/Installation Tool, NAS 1664-(20, -16 or -12) or
R Cannon No. CIET- (20, -16 or -12) or Deutsch No. M15570-(20,
R -16, -12) (Ref. Fig. 401)

R 3. Referenced Procedures

R Wiring Diagram Manual - Standard Practices

R 4. Removal/Installation

R A. Removal

R (1) If an electrical connector is involved, remove
R backshell.

R (2) Snap white end of tool over wire of contact to be
R removed.

R (3) Slowly slide tool along wire into insert until a
R positive resistance is felt.

R (4) Hold wire firmly against serrations on tool and pull
R both wire and tool out of connector.

R B. Installation

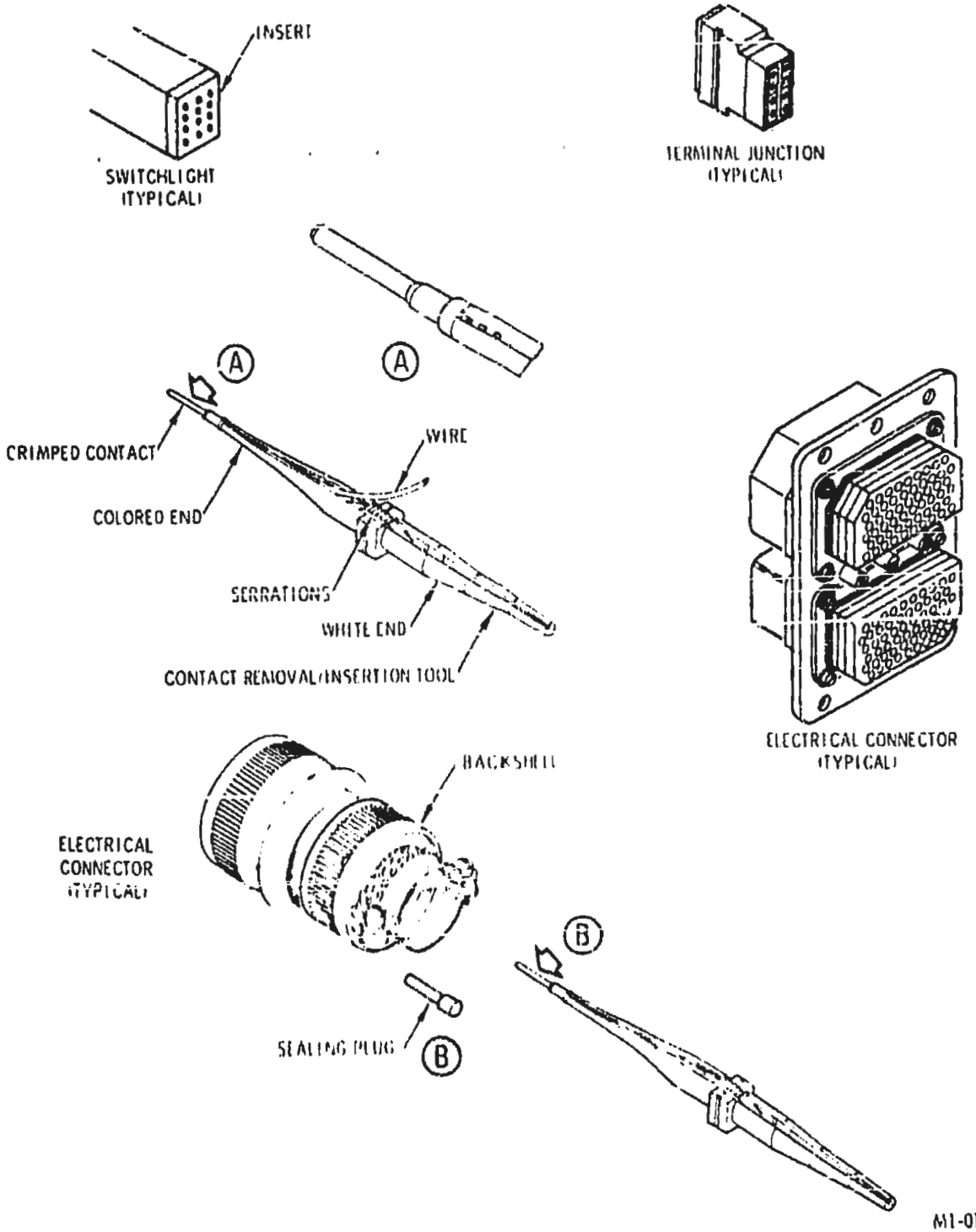
R (1) If an electrical connector is involved, remove threaded
R backshell from connector and slip over all wiring to be
R terminated in connector.

R (2) Place wire to be inserted along slot of colored half of
R insertion tool and snap wire into the tool. Insertion
R tool tip must butt against shoulder of crimped contact.

(3) Slowly push contact straight into connector insert. A firm stop indicates that the contact has seated in the insert.

(4) Release wire and pull out the tool.

(5) If an electrical connector or terminal junction, install appropriate size contacts or sealing plugs (Ref. Wiring Diagram Manual - Standard Practices). Shoulder of sealing plug must butt against connector insert.



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R R Crimped Contact - Removal and Installation
Figure 401

REMOTE CONTROL CIRCUIT BREAKER - REMOVAL AND INSTALLATION

1. General

R NOTE: For Removal and Installation procedure for Remote Control
R Circuit Breaker, see Maintenance Manual 24-50-02.

ELECTRIC BONDING AND GROUNDING CONNECTIONS - MAINTENANCE PRACTICES

1. General

Following paragraphs describe methods, procedures, and inspection requirements for establishing acceptable electrical bonding of components and grounding of electrical circuits in L-1011 aircraft.

2. Description

Grounding provides an electrical path between a component or electrical circuit and a basic structure, or provides electrical connection of return circuits to a basic structure.

Proper bonding provides:

A. Adequate conductive paths for current return and grounding of electrical and electronic equipment.

B. An integrated antenna ground plane for radio transmission and reception.

C. Protection of aircraft and personnel from electrical shock and hazard of lightning strikes.

D. Reduction in development of electrical interference.

E. Prevention of accumulation of static charges.

3. Equipment and Materials

Abrasive cloth or paper, 320 grit or smoother

Bonding brushes

R Chemical film, MIL-C-81706 Class 1A or equivalent

Clean, dry cloths

Corrosion protective compound, Deft. Inc. Chemical Coating Division P/N 01BL68 "Clear Blue," or equivalent

Paper towels

Rubber gloves

Sealing compound, Dow-Corning C-318 or equivalent

Sealing compound, fillet material, LCM40-2180 Type I or equivalent (Products Research Co. PR1422B-2 is an approved equivalent)

Sealing compound, brush material, LCM40-2180 Type II or equivalent (Products Research Co. PR1422A-2(W) is an approved equivalent)

Sealing compound, fillet material, LCM40-1218 Type I or equivalent (Products Research Co. PR1422B-1/2, 3M Co. EC1239B2, Coast Pro-Seal and Mfg. Co. 707B-2 are approved equivalents)

Sealing compound, brush material, LCM40-1218 Type II or equivalent (Products Research Co. PR6101, 3M Co. EC1239-A2, Coast Pro-Seal and Mfg. Co. 707A-2 are approved equivalents)

"Scotchbrite" pads, 3M Co.

Shallcross 670A millohmmeter or equivalent

Simpson 260 ohmmeter or equivalent

Solvent, E.O. Special (Ceebee Chemical Co.)

R AVTRON Model T477W Explosion-Proof Bonding Meter

1,1,1, Trichloroethane cleaning solvent, Federal Specification O-T-620

4. Maintenance Practices

A. Assemblies and/or Components not Requiring Bonding or Grounding

(1) Inherently Bonded Assemblies and/or Components.

(a) Joints or connections made by welding, brazing, sweating, or swaging.

(b) Ground stud plates with 3/16 inch diameter ground studs or smaller, attached to structure with upset head rivets using a staggered rivet pattern.

- One stud must use three rivets dry minimum
- Two to four studs must use five rivets dry minimum.

R • Five to ten studs must use one rivet dry for
R each stud.

R • More than ten studs must use ten rivets
R minimum.

R (2) Static discharger retainers attached with Lockheed
R LS10052AD3 rivets.

R (3) Other permanent metallic joints.

R B. Assemblies and/or Components Requiring Bonding or Grounding

R (1) Joints having one or more non-metallic member.

R (2) Clamped joints.

R (3) Ground stud plates with ground studs larger than 3/16
R inch diameter.

R (4) Spot bonding must be accomplished on non-permanent
R metallic joints with thickest member 0.190 inch or
R less, and remaining members 0.125 inch or less.

R (5) Double grounding with dual ground studs must be
R accomplished in hazardous vapor areas.

R (6) Other non-permanent metallic joints must be bonded or
R grounded.

R C. Size of Prepared Area

R (1) For forgings, castings, extrusions, and metal sheet
R material over 1/8 inch thick, clean area slightly
R larger than metal-to-metal contact area and
R approximately 1/8 inch larger around periphery of part
R being bonded.

R (2) For bonding straps, jumpers, and ground wires, clean
R area approximately 1 1/2 times diameter of washer or
R terminal lug.

R (3) For mechanical fasteners, clean area approximately 1
R 1/2 times diameter of bolt, screw, nut, or washer.

R (4) For aluminum flame-sprayed surfaces, clean area
R approximately 1 1/2 times diameter of each DVL-7800
R series washer or equivalent used in installation.

R D. Faying Surface Preparation

CAUTION: USE ONLY STAINLESS STEEL OR ALUMINUM BONDING BRUSHES.

USE ONLY 3M SCOTCHBRITE IN CLEANING ALUMINUM FLAME SPRAYED SURFACES.

DO NOT USE THE ROTARY TYPE SPOT CLEANING METHOD FOR FAYING SURFACES ON ALUMINUM OR STAINLESS STEEL STRUCTURES.

(1) Leave a clean, smooth-appearing surface, free from significant scratches, gouges, or other conditions having adverse structural effect, and remove a minimum of base metal when using abrasives, bonding brushes, or scrapers to remove protective finishes on surfaces to be bonded. Removal of hard metal coatings is not required.

R
R NOTE: Use of reversing air motor tools with bonding brushes is recommended to obtain more effective cleaning and longer brush life.

As an alternative to removal of protective finishes, surfaces to be bonded may be masked during anodize and paint operations.

WARNING: USE TRICHLOROETHANE IN A WELL-VENTILATED AREA. DO NOT INHALE VAPOR, AND AVOID FLUID CONTACT WITH SKIN. PROLONGED EXPOSURE MAY RESULT IN UNCONSCIOUSNESS OR LUNG OR SKIN IRRITATION.

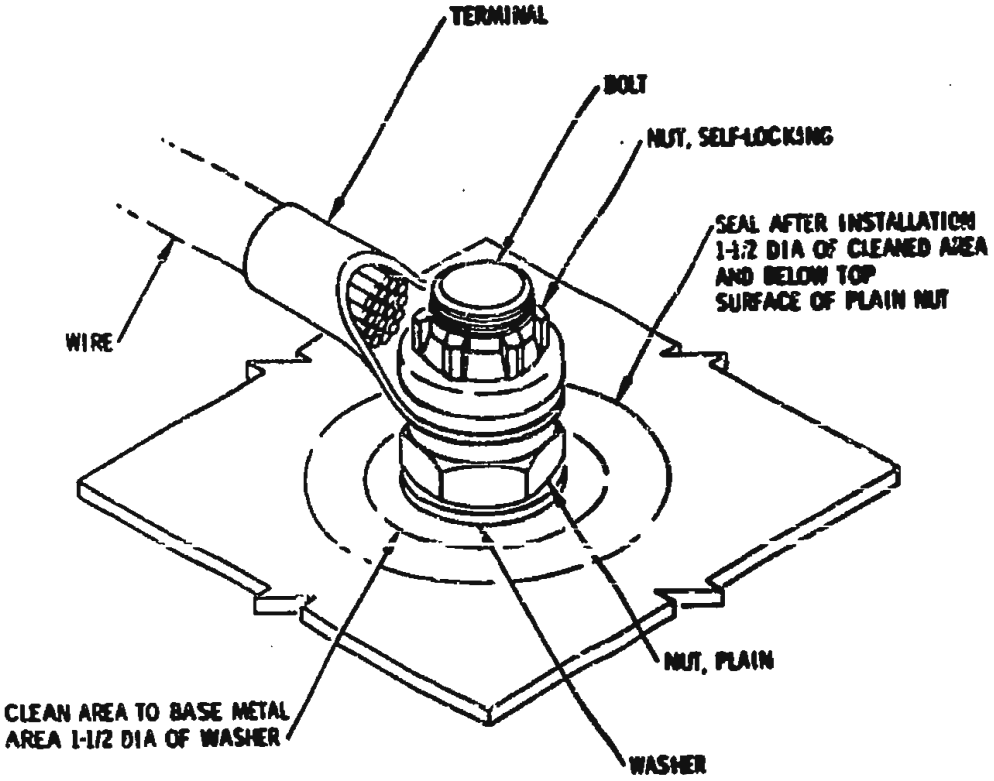
USE SOLVENT IN A WELL-VENTILATED AREA. DO NOT INHALE VAPOR, AND AVOID FLUID CONTACT WITH SKIN AND EYES. PROLONGED EXPOSURE MAY RESULT IN NAUSEA OR SKIN OR EYE IRRITATION.

CAUTION: DO NOT USE CAUSTIC SOLUTIONS SUCH AS LYE OR ALKALINE PAINT REMOVER FOR CLEANING FAYING SURFACES.

(2) Solvent Clean Faying Surfaces (Ref. Fig. 201).

(a) Lightly abrade surfaces masked during anodize and paint operations with 320 grit or smoother abrasive cloth or paper.

(b) Clean faying surface thoroughly by wiping with clean cloths or paper towels, dampened only with E.O. Special solvent for titanium or 1,1,1, Trichloroethane for other metals.



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R Typical Cleaned Faying Surface Area for Bonding and Grounding
R Figure 201

R EFFECTIVITY: ALL
R
001B

R (3) Mate surfaces to be bonded within eight hours of finish removal. If more than eight hours elapses, light abrade surfaces with 320 grit abrasive cloth or paper or smoother, and again wipe with appropriate solvent before bonding.

R (4) Prior to solvent evaporation, thoroughly wipe surfaces dry with clean paper towel.

R (5) Cleaned surface will exhibit water-breakfree properties prior to application of any sealants, corrosion protective compounds, chemical films, or other refinishing or sealing materials.

R E. Installation of Faying Surface Bonds (Ref. Fig. 202 and 203)

R (1) Immediately before bonding, again clean aluminum flame sprayed washer surfaces with Scotchbrite.

R (2) Remove all residue dust or powder from all faying surfaces with clean, lint-free cloth immediately before bonding.

R NOTE: Do not install ground studs directly into primary airframe structure. Use ground stud plates as necessary.

R F. Bonding Jumper and Ground Lead Installation

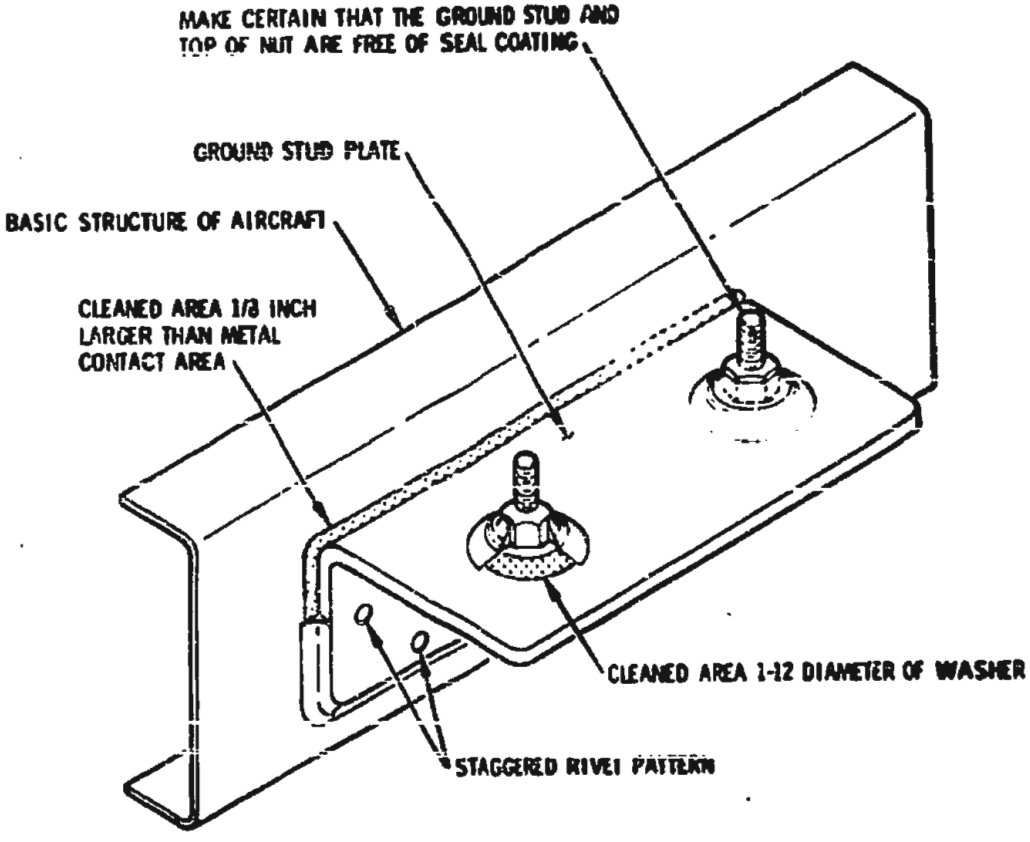
R (1) Ground any equipment or shields incorporating ground terminal with shortest possible lead to ground stud. Ground stud must be accessible.

R (2) Dual ground studs must be installed in hazardous vapor areas.

R (3) Refer to Table 201 for acceptable ground wire lengths and sizes to be used with equipment or components requiring maximum ground resistances of 0.0025 or 0.01 ohms.

R G. Acceptable Bonding and Grounding Determination

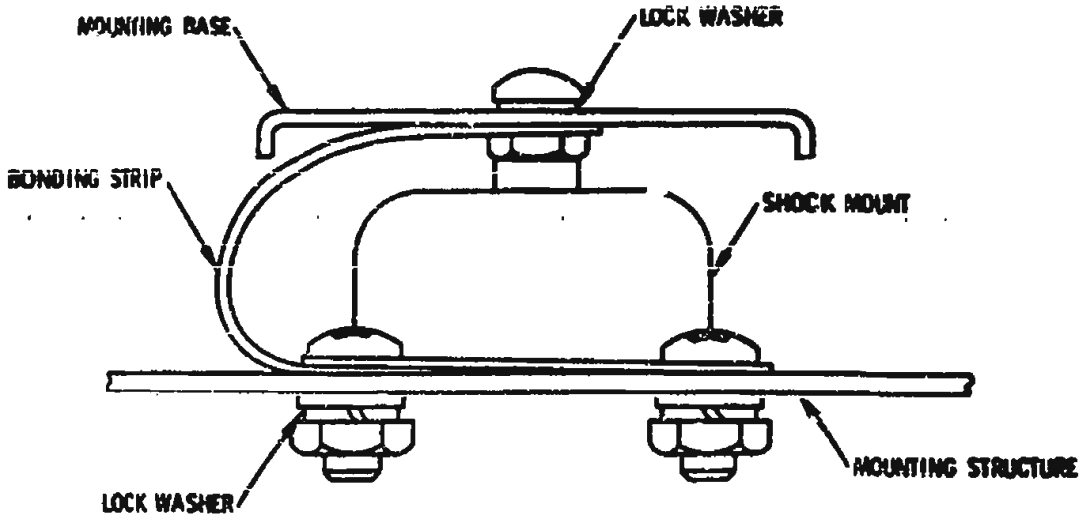
R (1) Resistance measurements will be made after repair or change to aircraft bonding or grounding connections, after mechanical connection has been made, and prior to application of final finishes or sealants.

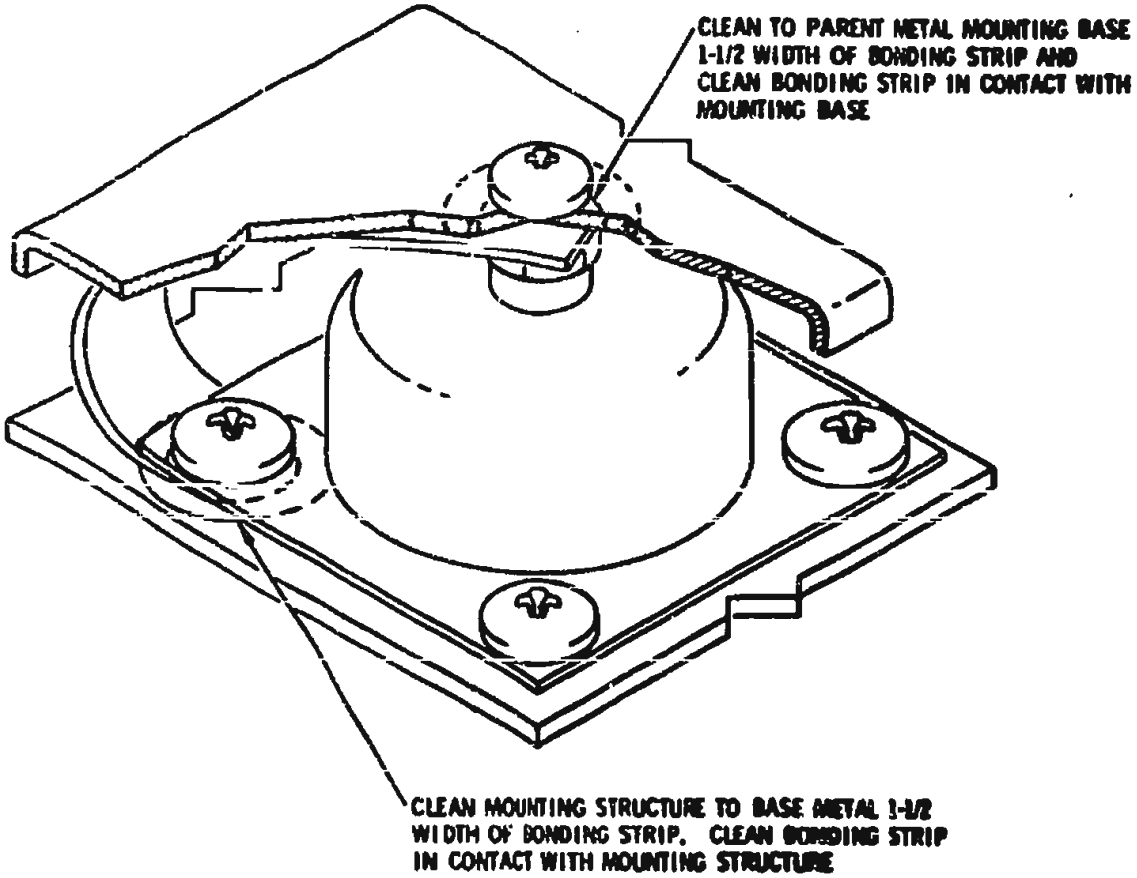

MAKE CERTAIN THAT THE GROUND STUD AND TOP OF NUT ARE FREE OF SEAL COATING
GROUND STUD PLATE
BASIC STRUCTURE OF AIRCRAFT
CLEANED AREA 1/8 INCH LARGER THAN METAL CONTACT AREA
CLEANED AREA 1-12 DIAMETER OF WASHER
STAGGERED RIVET PATTERN

M1-0000-20-618

R Ground Stud Requirements and General Practices
R Figure 202

R EFFECTIVITY: ALL
R
0018




CLEAN TO PARENT METAL MOUNTING BASE 1-1/2 WIDTH OF BONDING STRIP AND CLEAN BONDING STRIP IN CONTACT WITH MOUNTING BASE
CLEAN MOUNTING STRUCTURE TO BASE METAL 1-1/2 WIDTH OF BONDING STRIP. CLEAN BONDING STRIP IN CONTACT WITH MOUNTING STRUCTURE

M1-

R R Installation of Bonding Strips on Shock Mount
Figure 203

WIRE SIZE	MAX LENGTH FOR 0.0025 OHM (INCHES)	MAX LENGTH FOR 0.01 OHM (INCHES)
4	28.7	172.0
6	18.0	108.0
8	11.5	67.7
10	7.0	42.2
12	4.5	26.8
14	2.7	16.8
16		10.5
18		6.6
20		4.3
22		2.6

WARNING: ANY MEASUREMENTS MADE IN EXPLOSIVE VAPOR AREAS OF THE AIRCRAFT, AFTER FUEL HAS BEEN INTRODUCED INTO SUCH AREAS, ARE TO BE MADE WITH EXPLOSION-PROOF METERS, USING EXPLOSION-PROOF METHODS.

DO NOT USE THE SHALLCROSS MILLOHMMETER 670A FOR OBTAINING RESISTANCE MEASUREMENTS IN EXPLOSIVE VAPOR AREAS OF THE AIRCRAFT.

DO NOT APPLY PROBES OF THE INSTRUMENT DIRECTLY TO THE TERMINALS OF THE EXPLOSIVE SQUIBS, NOR TO ANY PART OF THE CIRCUIT LEADING TO SUCH A DEVICE. BEFORE PROCEEDING INTO EXPLOSIVE AREAS WITH THIS INSTRUMENT, VISUALLY CHECK TO VERIFY THAT NO PHYSICAL DAMAGE HAS OCCURRED WHICH MIGHT IMPAIR THE VAPOR TIGHTNESS OF IT'S HOUSING.

(2) DC resistance measurements will not exceed maximum values noted in Table 202.

(3) Make measurements with low-range ohmmeter, Shallcross millohmmeter 670A or equivalent for resistance values of 0.001 to 0.5 ohms, and Simpson ohmmeter 260 or equivalent for resistance values over 0.5 ohms.

R R R R R R CAUTION: DISCONNECT ALL ELECTRICAL POWER FROM THE AIRCRAFT, INCLUDING THE AIRCRAFT BATTERY, BEFORE USING THE BONDING METER. THE ACCURACY OF THE T477W BONDING METER IS AFFECTED BY THE PRESENCE OF DC POTENTIALS ON THE UNKNOWN RESISTANCE. ALSO, SIGNIFICANT METER DAMAGE MAY RESULT FROM DC POTENTIALS.

R R (4) Use an explosion-proof bonding meter, AVTRON Model T477W, for measurements made in hazardous vapor areas. Hazardous vapor areas include:

(a) Compartments adjacent to fuel tanks.

(b) Any compartment containing fluid/gas carrying equipment and lines, except those without disconnect joints.

(c) Fuel tank interior.

(d) Compartments interconnected with (b) and (c) above if flammable fluid/gases could enter them under any condition of aircraft flight or attitude.

(e) Fuel tank access doors.

(f) Vent and drain masts.

MAJOR ITEM	DESCRIPTION	MAXIMUM RESISTANCE (DC OHM)
1. APU	APU Frame to A/C Structure	.0025
2. BRAKES	L & R Landing Gear to Sensor	.0025
3. BUN WARMER	Frame to Primary Structure	.1
4. COLD STORAGE	Frame to Primary Structure	.1
5. CONTROL CABLE	L & R/H Foot Pedal to Structure	1.0
	Pedal Mount Arm to Structure	1.0
6. CONTROL COLUMN	Flt Sta 1st and 2nd Officer's Control Column to Basic Structure	1.0
	Nose Gear Steering to Structure	1.0
A. Control Lever	Control Lever to Structure	1.0
7. CONTROL SURFACES	L & R/H I/B Aileron Hinge Attach Points to	.01
A. Ailerons	Wing Primary Structure (5 Jumpers)	
	L & R/H O/B Aileron Hinge Attach Points to	.01
	Wing Primary Structure (5 Jumpers)	
B. Hor. Stab.	Across R & L/H Horizontal Stab. Main Pivot Bearings (2 Jumpers ea.)	.005
C. Elevators	Across R/L/H Elev. Hinge Points (8 Jumpers)	.01
D. Rudder	Rudder Hinge Attach Points to Vert. Stab. Structure (8 Jumpers)	.01
E. Slats		Inherent Bonding
F. Flaps & Vanes		Inherent Bonding

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R Direct Current (DC) Resistance of Bonding Paths
R Table 202 (Sheet 1)

R EFFECTIVITY: ALL
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MAJOR ITEM	DESCRIPTION	MAXIMUM RESISTANCE (DC OHM)
7. (Continued)		
G. Spoilers	Hinge Point to Wing Primary Structure	
	L/H & R/H Spoiler No. 1 (3 Jumpers ea.)	.01
	" " " No. 2 "	.01
	" " " No. 3 "	.01
	" " " No. 4 "	.01
	" " " No. 5 "	.01
	" " " No. 6 "	.01
8. STATIC DISCHARGER	Static Discharger Retainer to A/C Skin	
A. Ailerons	L & R/H O/B Aileron (6Tr. Ea.)	.1
B. Wing Tips	L & R/H Outer Wing Tip (3Tip Ea.)	.1
	L & R/H Aft Wing Tip (1Tr. Ea.)	.1
C. Rudder	Rudder Tr. Edge (7Tr.)	.1
	Ruddor Tip (1 Tip)	.1
D. Vert. Stab.	Vert. Stab. Tip (2Tip)	.1
E. Elevator	Elev. Tr. Edge (5 Tr. Ea.)	.1
F. Hor. Stab.	Hor. Stab. Tip (2 Tip Ea.)	.1
9. DOORS	Door to Primary Structure	
A. Cargo		.01
B. Passenger		.01
C. Escape Hatch	Escape Hatch (1 Jumper)	.01
	Escape Hatch – Galley	.01
D. MLG	Main Landing Gear Doors (2 Jumpers Ea.)	.01
E. NLG	Nose Landing Gear Doors	
	2 Doors L & R (2 Jumpers Ea.)	.01
F. Galley		.01

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R Direct Current (DC) Resistance of Bonding Paths
R Table 202 (Sheet 2)

R EFFECTIVITY: ALL
R
0018

MAJOR ITEM	DESCRIPTION	MAXIMUM RESISTANCE (DC OHM)
10. ELECTRICAL RACKS	Trays & Shelves to Primary Structure	.0025
11. ELECTRONICS	From Shelves and Rack to Primary Structure	.0025
A. Fwd. Electronic Service Center	Rack installation	.0025
	From Equip. to Primary Structure	.0025
	Equip. installation	
B. Mid Electronic Service Center	From Equip. to Primary Structure	
	Equip. installation	.0025
C. Aft Electronic Service Center	From Shelves and Rack to Primary Structure	
	Rack installation	.0025
	From Equip. to Primary Structure	
	Equip. installation	.0025
D. Peculiars	Shelf installation – VGH Recorder	.0025
	Receiver installation – VGH	.0025
	Panel installation – Audio Sel & MAG comp. cont.	.0025
	Equip instl. – HF com. Fault Detect	.0025
	Sensor instl. – Angle of Attack	.0025
	Sensor instl. – Total Temp	.0025
	Accel. instl. – Aids	.0025
	Bracket instl. – Aids accel.	.0025
	Accel. instl. – VGH	.0025
	Bracket instl. – VGH Accel. Xmtr.	.0025
	Wave Guide instl. – Weather Radar	.0025
	Bracket instl. – Wave Guide	.0025
	Panel instl. – Aids Thermo Junc.	.0025
	Panel Assy. – Aids Thermo Junc.	.0025
	Preamp instl. – VOR	.0025
	Equip. instl. – Flt. Rec. Accel.	.0025
	Brkt. instl. – Flt. Rec. Accel.	.0025

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R Direct Current (DC) Resistance of Bonding Paths
R Table 202 (Sheet 3)

R EFFECTIVITY: ALL
R
0018

MAJOR ITEM	DESCRIPTION	MAXIMUM RESISTANCE (DC OHM)
12. ELECTRIC MOTOR MTG & RACKS	Motor Base to Primary Structure	.0025
13. METAL CONDUITS	Conduit to Primary Structure	.1
14. PLUMBING	Component to Primary Structure	
A. Fuel Lines Outside of Tank	Tubing instl. – Rear Beam	1.0
	Shroud instl.	1.0
	Hose instl. – F.S. 1212 to F.S. 1323	1.0
	Tubing instl.	1.0
	Shroud instl.	1.0
	Shroud – Fwd. Drain instl.	1.0
	Tubing & S/O Valve instl. – No. 2 Eng.	1.0
	Plumbing & Support instl. – Fuel Sta.	1.0
	Flt. Engr's Fuel Panel	1.0
	Fuel Sta. Panel	1.0
	Tubing & S/O Valve instl. – APU	1.0
	Piping instl. – Eng. #1 & #3	1.0
	Pylon Fuel Feed – Eng. #1 & #3	1.0
B. Fuel & Vent Lines inside Tank	Plumbing & Support Instl. Fuel Vent Valve & Level Cont. SW. Instl.	1.0 .0025
C. Hydraulic	Line to Primary Structure	1.0
1. System		1.0
2. Wing		1.0
D. Oxygen	From Line to Primary Structure	1.0
15. FAIRINGS – FLAME SPRAYED	Center of Flame Spray Panel Skin to Adjacent Metal Structure or Skin	
A. Fuselage to Wing		.01

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R Direct Current (DC) Resistance of Bonding Paths
R Table 202 (Sheet 4)

R EFFECTIVITY: ALL
R
001B

MAJOR ITEM	DESCRIPTION	MAXIMUM RESISTANCE (DC OHMS)
15. (Continued)		
B. Afterbody		.01
1. Upper Center Engine Fairing		.01
2. AFT No. 2 Engine Fairing		.01
3. No. 2 Engine Glove Fairing		.01
16. ANTENNAS	Antenna Base to Primary Structure	.0005
	Flux Valve installation	.0025
	ADF Loop Antenna installation	NONE
	Loran Coupler installation	.0025
	ADF Sense Coupler	.0025
	HF Antenna Metal Cap to Fin Structure	.0025
17. WING – LEADING & TRAILING EDGE		
A. Covers	Center of Cover to Wing Structure	1.0
B. Blowout Doors	Center of Door to Wing Structure	1.0
C. Fairing	Center of Fairing to Wing Structure	1.0
D. Doors	Leading Edge Door to Wing Structure	1.0
	Tip Access Door to Wing Structure	.0025
E. Panels	Center of Panel to Wing Structure	1.0

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R Direct Current (DC) Resistance of Bonding Paths
R Table 202 (Sheet 5)

R EFFECTIVITY: ALL
R
001B

MAJOR ITEM	DESCRIPTION	MAXIMUM RESISTANCE (DC OHMS)
18. SERVICE DOORS/ COVERS	Doors/Covers to Wing Structure Fuel Tank Outer Surface	
A. APU Pump	APU Pump Cover to Wing Structure	.0025
B. Drain Valve	Drain Valve Cover to Wing Structure	.0025
C. Fuel Probe	Fuel Probe Cover to Wing Structure	.0025
D. Filler Cap	Filler Cap Adapter Ring to Wing Structure	.0025
E. Sight Gage	Sight Gage Cover to Wing Structure	.0025
F. Boost Pump	Boost Pump Cover to Wing Structure	.0025
G. Access Doors	Access Doors to Wing Structure	.0025
SERVICE DOORS/ COVERS	Doors/Covers to Fuselage Structure	
	S-1 Avionics	.01
	S-2 ELC (Fuselage & Fairing)	
	ECS Access L & RH	
	Galley to ELC (STA. 943)	
	Ground Air Connection R & LH	
	Fwd. Waste System Service Panel	
	Aft. Waste System Service Panel	
	Temp. Control Indicator Door	
	Main Landing Gear Switch Box	
	Power Recept. Panel	
	Air Start Panel (STA. 993) (3 Doors)	
	APU External Control Panel	
	RAM Air Turbine L & R (FS 1200)	
	Hyd. Service Center (FS 1233-1333) (2 Doors)	
	Pneumatic Service	
	Nose Jack Cover	
	NLG Trunnion Pin Cover	
	Environmental Control Cover	.01
	Doors/Covers to Structure	
	Engine #2 & Horizontal Stabilizer	

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R Direct Current (DC) Resistance of Bonding Paths
R Table 202 (Sheet 6)

R EFFECTIVITY: ALL

R
0018

MAJOR ITEM	DESCRIPTION	MAXIMUM RESISTANCE (DC OHM)
18. SERVICE DOORS/ COVERS (Continued)	Access Doors	.01
	Stabilizer Leading Edge	.01
	Stabilizer TIP	.01
	Access Panels	.01
	Doors/Covers to Structure Afterbody & Vertical FIN	
	Service Doors	.01
	Starter Valve Cover	.01
	Rudder Tip	.0025
	Fin Leading Edge	.01
	Anti-Ice Valve Access Panels	.01
	Heat Exchanger Access Panels	.01
	Rudder Leading Edge Access Panels	.01
	Doors/Covers to Structure	
	Air Driven Hydro Pump	.01
	Heat Exchanger	.01
	Cargo Door Latch Cover	.01
	Fwd. Pressure BLHD Door	.01
	Wing Box Access Door	.01
	FS STA 983 Panel	.01
19. FUEL TANK		
A. Drain Masts	From Drain Mast to Outer Wing Structure	
	APU Compartment	.0025
	Keelson – STA. 1358.0	.0025
	Center Section Vent	.0025
	AfterBody	.0025
	All Engines	.0025
B. Jettison Tube	From Tube to External Outer Wing Structure (1 Ea. Wing)	.0025
20. ENGINE	Engine to Pylon #1 & #3 (2 Jumpers Ea.)	.0025
	#2 Engine to AfterBody Structure (2 Jumpers)	.0025
	Pylon to Wing #1 & #3 (2 Jumpers Ea.)	.0025

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R R Direct Current (DC) Resistance of Bonding Paths
Table 202 (Sheet 7)

R EFFECTIVITY: ALL

R R 0018

MAJOR ITEM	DESCRIPTION	MAXIMUM RESISTANCE (DC OHM)
21. EXTERIOR LIGHTS	From Light Metal Base to Primary Structure From External Lens Frame to Primary Structure	
A. Position	Forward Position Lights R & LH Tail Position Lights R & LH	.0025 .0025
B. Ant. Collision	Keelson Cab Top	.0025 .0025
C. LOGO	Horizontal Stabilizer, R & LH	.0025
D. Wing Scan	Wing, R & LH	.0025
E. Emergency	Evacuation	.01
F. Nose Wheel/Taxi Landing	Nose Wheel	.0025
G. Landing	Wing Root R & LH	.01
H. Runway Turnoff	Wing Root R & LH	.01
22. REFRIGERATOR	Shell to Structure	.0025
23. SINKS	Sink to Structure	1.0
24. TANK GAGES	Gage base to Primary Structure	.0025
25. HYDRAULIC TANKS	Tank body to Structure	1.0
26. FUEL SHUT OFF VALVES	Fuel shut-off valve body to Structure	.0025
27. FOOD CART	Cart body to Plug Ground Pin	.
28. GALLEY OVENS	Oven shell to Structure	.0025
29. GENERATORS	Generator to Primary Structure Generator Neutral to Primary Structure	.0025

MAJOR ITEM	DESCRIPTION	MAXIMUM RESISTANCE (DC OHMS)
30. INSTRUMENT PANELS	Panel to Structure	.01
31. MAIN LANDING GEAR	MLG Grounding Lug to Primary Structure	.0026
32. NOSE LANDING GEAR	NLG Strut to Primary Structure	.0026
33. LAVATORIES		
A. Toilets	Bowl to Structure	.1
B. Basin	Basin to Structure	.1
C. Water Heaters	Water Heater base to Structure	.1
D. Water Coolers	Water Cooler base to Structure	.1
E. Flush Handle	Handle to Structure	.1
34. OIL TANKS	Tank body to Structure	1.0
35. GALLEY ELEVATOR	Elevator to Structure	1.0
36. OVERHEAD COAT CLOSETS		
A. Metal Slide	Slide to Structure	.1
B. Drive Motor	Motor Base to Structure	.1
37. MULTIPLEX INSTRUMENT PANEL	Panel to Structure	.01
38. MULTIPLEX DECODERS	Decoder to Structure	.01
39. CIRCUIT BREAKER PANELS	Panel to Structure	.01
40. NOSE RADOME	Each Diverter Strip (6) to Radome Mainring Mainring to fuselage Primary Structure	.0026 .0026

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R Direct Current (DC) Resistance of Bonding Paths
R Table 202 (Sheet 9)

R EFFECTIVITY: ALL
R
001B

MAJOR ITEM	DESCRIPTION	MAXIMUM RESISTANCE (DC OHM)
41. CABIN SERVICE CENTERS	Forward Service Center-Basic Mid-Cabin Service Center Aft Coffee Bar Fwd Bev. Bar – Satellite Fwd Serv. Center – Satellite Aft Serv. Center – Satellite	
A. Ovens	Base to Structure	.1
B. Water Heaters	Base to Structure	.1
C. Water Coolers	Base to Structure	.1
D. Coffee Makers	Base to Structure	.1
E. Sinks	Base to Structure	.1
F. Work Counters	Base to Structure	.1
G. Counter Lights	Base to Structure	.1
H. Water Fountains	Base to Structure	.1
I. Circuit Breaker Box	Base to Structure	.1
J. Blenders	Base to Structure	.1
K. Serv. Ctr. Frame	Frame to Primary Structure	.1
L. Hot Cup Warmer	Base to Structure	.1
M. Battery Pwr Pack	Base to Structure	.1
42. ELECTRICAL SERVICE CENTERS	Bases of all equipment to Primary Structure	.0026
43. HYDRAULIC EQUIPMENT	Base to Primary Structure	1.0

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R Direct Current (DC) Resistance of Bonding Paths
R Table 202 (Sheet 10)

R EFFECTIVITY: ALL
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H. Sealing and Refinishing

(1) Wherever protective coatings or films have been removed, seal and refinish exposed surface.

(2) Seal or refinish within 24 hours of inspection. Sealing and refinishing must not be delayed more than seven days after removal of original protective finish.

WARNING: DO NOT ALLOW SEALANT TO CONTACT SKIN OR EYES. PROLONGED EXPOSURE MAY RESULT IN SKIN OR EYE IRRITATION.

(3) Reprime magnesium parts within 24 hours after removal of original finish. If painted finish is not required after reassembly, using gloves, seal with wipe-on, wipe-off sealing compound C-318 or equivalent.

(4) Assemble titanium clips to aluminum bulkhead at F.S. 983. Using gloves, seal with LCM40-2180 Type I sealant or equivalent, smoothing excess sealant squeezed from faying surfaces into a fillet around periphery of joint.

(5) Using gloves, brush or fillet seal ground studs attached to basic structure without ground stud plates to a thickness of 0.020 to 0.030 inches, at both ends, using sealing compound LCM40-2180 Type I or II or equivalent.

WARNING: USE COMPOUND IN A WELL-VENTILATED AREA. DO NOT INHALE VAPOR, AND AVOID MATERIAL CONTACT WITH SKIN AND EYES. PROLONGED EXPOSURE MAY RESULT IN LUNG, SKIN, OR EYE IRRITATION.

(6) Using gloves, seal other ground studs with corrosion protective compound.

(7) Cover exposed faying surfaces on ground stud plates with corrosion protective compound, using gloves and taking care to avoid compound remaining on top surface of nut or ground stud threads.

(8) Using gloves, brush or fillet seal bonding jumper connections and attaching fasteners in fuel areas and to basic structures to a thickness of 0.020 to 0.030 inches, at both ends, using sealing compound LCM40-2180 Type I or II or equivalent.

(9) Using gloves, fillet seal around periphery of metal-to-metal contacts in fuel areas which are part of

electric bond paths, such as clamps or joints, with sealing compound LCM40-2180 Type I or II or equivalent.

(10) Using gloves, touch up flush heads of retainer rivets with corrosion protective compound. Stud retainers and bucked side of retainer rivets need not be sealed or painted.

WARNING: USE CHEMICAL FILM IN A WELL-VENTILATED AREA. DO NOT INHALE VAPOR, AND AVOID FLUID CONTACT WITH SKIN AND EYES. PROLONGED EXPOSURE MAY RESULT IN LUNG, SKIN, OR EYE IRRITATION.

(11) Coined-in ground studs do not require sealing, except as noted in Step (7). Noted faying surfaces must be chemical film sealed, using gloves, with MIL-C-81706
R Class 1A Chemical film, rather than sealing compound. Apply chemical film as follows:

(a) Apply chemical film by immersing part or by passing part in front of stationary power spray nozzles.

(b) Rinse parts thoroughly as soon as perceptible golden color develops. Do not allow solution to dry on surface.

(c) Ensure the film is continuous, uniform, and of high quality, being free from breaks, scratches, powdery areas, loose coating, discontinuities, and other damage which would reduce its serviceability.

NOTE: Finished surface will be iridescent golden to light brown in color.

(12) Static ground connections made to structure and/or equipment not directly attached to basic structure do not require corrosion protective sealing.

(13) Other exposed bare metal surrounding bonded surfaces must be finished. Using gloves, finish with
R MIL-C-81706 Class 1A chemical film. Apply chemical film as outlined in Steps 11(a) thru (d).

(14) Using gloves, brush, spray or fillet coat critical corrosion areas 0.025 inches over edge of bonded joints with Lockheed LCM40-2180 Type I or II or LCM40-1218 Type I or II sealing compound, or equivalent. Critical corrosion areas include:

(a) Forward lavatory and coffee bar, below WL240.

(b) Waste storage tank area, below WL200.

(c) Ram air plenum area, below WL180.

(d) Water separator and ECS duct area, below WL190.

(e) Forward cargo compartment area, below WL125.

(f) Galley area, below WL144.

(g) Mid electrical service area, below WL125.

(h) Aft body areas, including all bond lines below MHB.

NOTE: MHB refers to "Maximum Half-Breadth" which is defined as the widest fuselage width at a given fuselage station.

(i) Area below cabin doors.

(j) Center and aft cargo compartment area, below WL200.

(k) Aft coffee bar and aft lavatory area.

FLIGHT STATION AND GALLEY CIRCUIT BREAKERS REMOVAL AND INSTALLATION

1. General

The 3-phase ac, single-phase ac and dc circuit breaker installed in the flight station and galley have locating pins to facilitate proper installation and prevent rotation of the breaker after installation. When installing these circuit breakers, care must be exercised to assure that this locating pin mates properly with the hole provided for it in the circuit breaker panel.

2. Referenced Procedure

24-41-00 External Power/Ground Service System - Maintenance Practices

3. Removal/Installation

A. Removal

(1) On APU CONTROL panel, zone 215, place MASTER POWER switch in OFF position and tag.

(2) On pilots center console, zone 210, place the three FUEL AND IGNITION switches in the off position and tag.

(3) Deenergize external power source (Ref. 24-41-00).

(4) Remove external power plug from receptacle located on the lower fuselage just aft of the nosewheel well at FS 458, and tag receptacle.

(5) Gain access to flight station or mid electrical service center (MESC), zone 137.

(6) Unfasten panel in flight station or cover assembly in MESC.

(7) Remove terminal insulators, then tag and remove all wires from the circuit breaker to be removed.

(8) Remove mounting nuts and remove circuit breaker.

B. Installation

R (1) Verify that switches are positioned as directed in
R Steps 3A(1) and (2).

R (2) Verify that external power plug is removed and that
R receptacle is tagged.

R (3) Verify that locating pin mates with hole provided for
R it in panel. Install hardware and tighten mounting
R nut.

R (4) Connect all wires to proper terminals and remove tags.

R (5) Remove tags from switches [Ref. Steps 3A(1) and (2)].

R (6) Remove tag from external power receptacle and plug in
R external power source.

R (7) Energize aircraft electrical system (Ref. 24-41-00).

R (8) Re-fasten circuit breaker panel in place in the flight
R station or replace galley circuit breaker panel cover
R assembly in MESC.

R (9) Close circuit breaker and verify that system controlled
R by that breaker functions properly.

R (10) Open circuit breaker and verify that system no longer
R functions.

R (11) Deenergize aircraft electrical system (Ref. 24-41-00).

STANDARD PRACTICES - FLIGHT CONTROLS

R 1. General

R Standard practices pertaining to the flight control system are
R contained in this section.

R LOCKCLAD CONTROL CABLES - INSPECTION AND CHECK

R 1. General

R Lockclad cable consists of normal flexible cable that has an
R aluminum tube swaged around the cable. The aluminum tube
R covering is installed to improve cable stiffness and protect the
R steel cable against wear and corrosion. The aluminum tube is
R not required as a load-carrying part of the cable.

R The aluminum tubing can be worn completely through without
R degrading rated strength of the cable. The aluminum tubing has
R a nominal thickness of 0.035 inch. Partial loss of the aluminum
R tubing over a few inches affects the cable stiffness only a
R negligible amount, but exposed steel cable is now vulnerable to
R corrision and wear. Corrision of the lockclad aluminum tubing
R should be removed.

R If the Lockclad cable aluminum tube is worn or corroded through
R to the steel cable, refer to Section 20-00-02, Inspection and
R Check, for the steel cable wear and corrosion limits.

R WING FLAP AND VANE LUBRICATION FITTINGS - APPROVED REPAIRS

R 1. General

R Some of the pressed lubrication fitting inserts are being forced
R out by grease gun pressure during lubrication. This type of
R bushing is installed in 64 locations in the wing flap system.

R This procedure provides the information for installing a
R threaded bushing in those installations where the pressed
R bushing separates from the fitting. The new configuration
R threaded bushing is being installed in production aircraft
R 018-999.

R 2. Equipment and Materials

R Drill, No. X, (0.396 to 0.403 inch)

R Drill, No. X, (0.396 to 0.403 inch)

R Countersink, 100-degree

R Tap, 7/16-14 UNC

R Sealing compound, PR-1431G, Type 1, Products Research

R Insert, threaded, MS51831-202, Tridair Industries Fastener
R Division Group

R 3. Referenced Procedures

R 12-23-00 Flight Controls Lubrication

R 27-51-00 Flap Control System - Adjustment and Test

R 4. Approved Repairs

R A. Replacement of Pressed Insert with Threaded Insert

R NOTE: When reworking some fittings, it will be necessary to
R remove the pivot pin from the fitting lug to prevent
R damaging the pin during the drilling operation. In
R some cases, where pin removal is difficult, the
R fitting must be removed for the rework.

R (1) Use 100-degree countersink to countersink hole 0.437 to
R 0.457 inch diameter.

(2) Drill hole (using size X drill) to depth shown on Fig. 801.

(3) Tap hole using 7/16-14 UNC to full thread depth of 0.43 to 0.46 inch (Ref. Fig. 801).

(4) Clean and deburr hole. Verify that all chips are removed from hole.

R R (5) Wet install threaded insert flush to 0.03 inch above surface of fitting using sealing compound.

R R (6) Align locking keys with lug hole and drive keys flush with surface of threaded insert (Ref. Fig. 801).

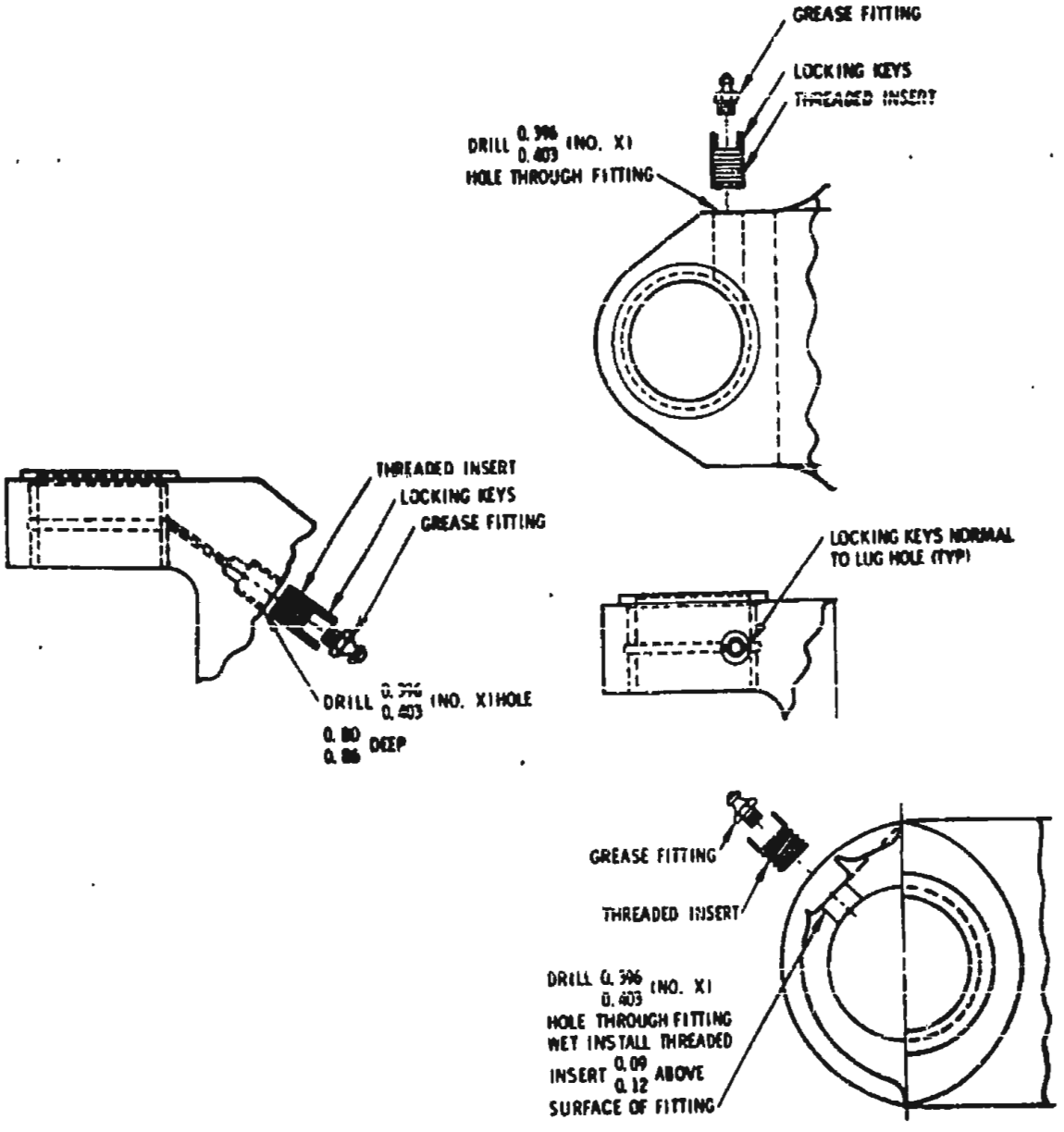
(7) Install lube fitting.

R (8) Install pivot pin in end fitting.

R (9) Install end fitting.

R (10) Lubricate end fitting (Ref. 12-23-00).

R (11) If pin or end fitting was removed, perform flap control system operational test to verify normal flap operation (Ref. 27-51-00, Adjustment and Test).



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R Lubrication Fitting Threaded Insert Installation
R Figure 801

C CABLE TURNBUCKLE LOCKING CLIPS - REMOVAL/INSTALLATION

C 1. General

C Cable turnbuckles are used which are safetied by a lock clip or
C lockwire.

C 2. Equipment and Materials

CR Corrosion Preventive Compound, MIL-C-16173, Grade 2. Refer to
CR 20-12-01, Lubricants.

C Lock-wire, Fed Spec. QQ-W-390, Cond A, 0.024, 0.031, 0.043 inch
C diameter as required.

C 3. Removal and Installation

C A. Remove Cable Turnbuckle Locking Clips

C (1) Remove turnbuckle locking clips by exerting a twisting
C force upon the clip forcing it out of hole in center of
C turnbuckle barrel and extracting clip from turnbuckle
C slot. Discard turnbuckle locking clip after removal
C from airplane. Turn turnbuckle barrel until cables
C become disengaged.

C B. Install Cable Turnbuckle Locking Clips (Ref. Fig. 401)

C CAUTION: DO NOT REUSE LOCKING CLIPS OR CLIP RELIABILITY
C WILL BE COMPROMISED.

C (1) Apply a thin coat of corrosion preventive compound to
C threads of turnbuckle barrel and cable terminals.

C (2) Engage turnbuckle barrel with both threaded cable
C terminals and turn barrel until not more than three
C threads are exposed outside barrel and proper cable
C tension is reached.

C (3) Align slot in barrel with slot in cable terminal.

C (4) Insert straight end of locking clip into aperture
C formed by aligned slots.

C (5) Place hooked end of locking clip over hole in center of
C turnbuckle barrel and seat hook loop into hole.

CR (6) Application of pressure to hook shoulder will engage hook lip in turnbuckle barrel and complete locking one terminal.

CR (7) Repeat Steps (3) thru (6) to lock other terminal.

CR NOTE: Both locking clips may be inserted in same turnbuckle barrel hole.

CR (8) Check both turnbuckle locking clips for proper engagement of hook lip in turnbuckle barrel hole by applying slight pressure in the disengaging direction.

CR C. Install Cable Turnbuckle Lock-wire (Ref. Fig. 401)

CR NOTE: Lock-wire turnbuckle if locking clips not available.

CR (1) Apply a thin coat of corrosion preventative compound to threads of turnbuckle barrel and cable terminals.

CR (2) Engage turnbuckle barrel equally with cable terminals and turn barrel until not more than three threads are exposed outside the barrel and proper cable tension is reached.

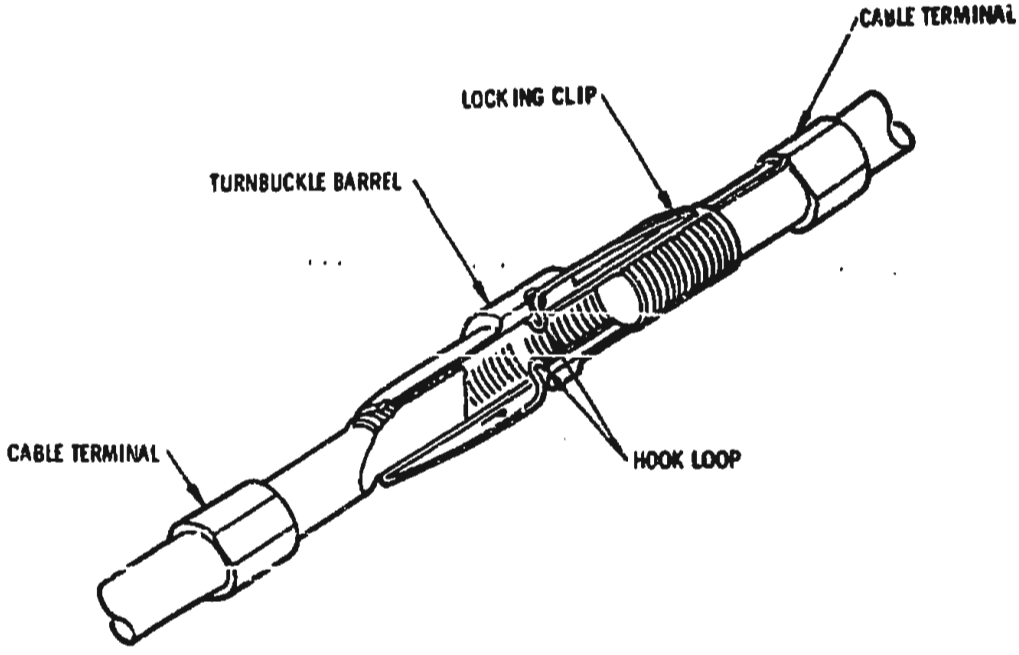
CR (3) Insert correct diameter stainless steel soft annealed wire. Use .024 for 1/16" cable, .031 for 3/32" or 1/8" cable, .043 for 5/32" thru 5/16" cable.

CR (4) Twist wire. Do not use any tool for this operation which might nick wire.

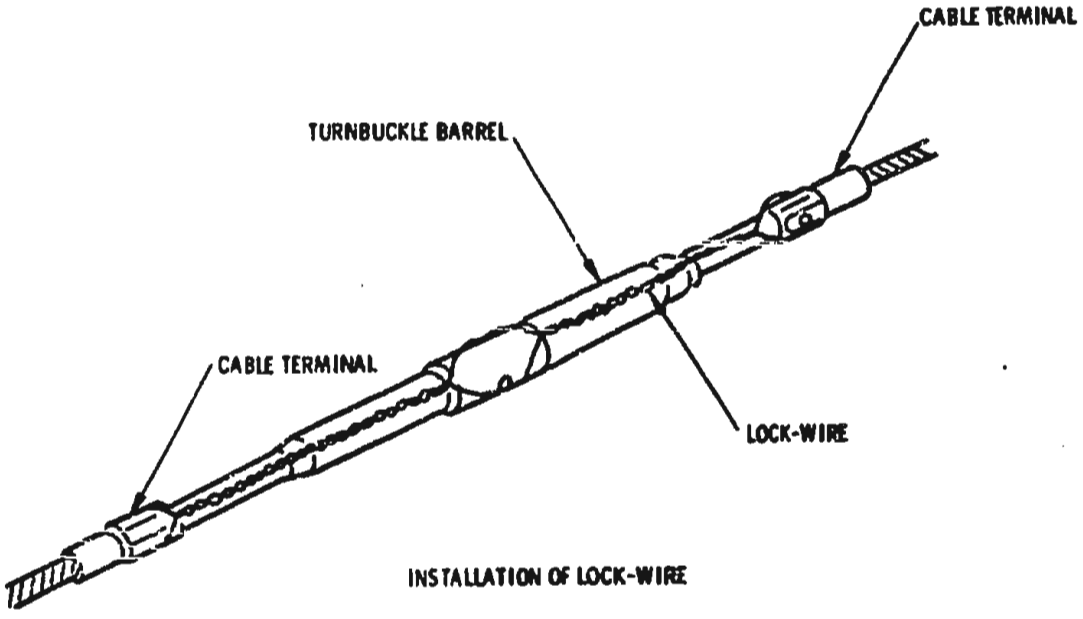
CR (5) Insert ends of wire through opposite holes in barrel. Pull wire through. If tool is used, apply only on ends of wire.

CR (6) Repeat item (4). Twist wire down to hole in terminal, insert end of one wire in hole, pull through and twist ends together. Cut off length in excess of 5/8" of twisted ends.

CR (7) Push twisted ends back to lie flat against terminal.



INSTALLATION OF LOCKING CLIPS



INSTALLATION OF LOCK-WIRE

M1-0000-20-752

CR Safetying of Cable Turnbuckles
CR Figure 401

EFFECTIVITY: ALL

001B

CR

CONTROL CABLES - INSPECTION/CHECK

CR 1. General

CR A. Aircraft control cables are constructed of thin wire CR strands, each strand being an individual unit of hard steel. CR Thus, if one strand is broken, the cable is only partially CR weakened.

CR B. Cable type and construction is indicated by two figures, the CR first giving the number of strands and the second the number CR of wires per strand. For example, a 7 x 7 flexible cable CR consists of seven strands, each of which is composed of 7 CR individual wires. The more strands a cable has the more CR flexible it is; therefore, 7 x 7 and 7 x 19 cables are used CR whenever cables pass through pulleys or when bending is CR necessary. Non-flexible cable consists of 19 wires formed CR into one strand, such as the 1 x 19 cable. This strand has CR little flexibility and is not intended for operation over CR pulleys.

CR NOTE: 1 x 19 cable must be of R.H. lay construction when CR used in the same cable run as flexible cable.

CR C. Tests have shown that flexible cables in service may have CR broken wires without critical lost of strength. A 7 x 7 CR cable, for example, may have as many as two broken wires in CR any one-foot length and still carry its rated load.

CR D. Wire breakage occurs most frequently where cables pass CR through fairleads or around pulleys; therefore, these areas CR should be checked carefully. Badly corroded or worn cables CR should be replaced.

CR 2. Corrosion Preventative

CR A. Corrosion can destroy a cable just as effectively as a CR hacksaw.

CR (1) The only cleaning of aircraft control cables that is CR permitted is with a dry clean cloth. Solvents or any CR abrasive materials are prohibited. Cables that are CR "Cleaned" must be relubricated per paragraph (2) below.

CR (2) During manufacture cables are soaked in a hot lubricant CR conforming to specification AN-C-124a. All cables CR shall be relubricated to prevent further corrosion, CR just prior to installation in an aircraft in accordance CR with the following procedure.

C (a) Wipe cable free from dust and dirt.

CR (b) Brush or wipe full length of cable with corrosion
CR protection compound (MIL-C-11796B class 3).

CR NOTE: This compound is also used for retreating
C previously installed cables.

C 3. Swaged Type Fittings/Short Section Cable Repair (Ref. Table 601)

C A. The practice of installing short cable sections to replace
C worn portions of the original cable, or to improve
C installation and removal of the cable system is structurally
C satisfactory and is approved so long as the following
C requirements are met:

C NOTE: On cable assemblies, other than lock-clad, the entire
C cable must be replaced if a short section is
C defective and the airplane is in a base visit of over
C 5 working days duration. On lock-clad cable
C assemblies, short cable section repairs may be
C considered permanent replacements.

C (1) The swaged fitting must be of the proper size for the
C cable involved (i.e., a 1/8 fitting on a 1/8 inch
C cable, etc.).

C (2) The fitting must be installed by an approved machine,
C either of the stationary or hand type and must pass
C either the required pull test or a go-no-go check on
C the finished swaged portion of the fitting to assure
C that the installation is airworthy. Terminals with
C cracks, nicks, or indentations shall be rejected. The
C swaging die shall not touch hex, fork, or eye portion
C of terminals.

C (3) The fitting must be installed in a portion of the cable
C system that is readily available for inspection.

CR (4) The fitting must be so located on the cable system that
CR it clears all pulleys, fairleads, structure, or other
CR units under all movements of the cable as well as the
CR movement of all other units in the vicinity of the
CR fitting. In other words, the fitting must be installed
CR so that the movement of the cable is not impaired in
CR any way.

CR NOTE: Inspection shall have the final decision as to
CR whether or not the fitting meets these
CR requirements.

CR (a) The following chart (Table 601) indicates the
CR required shank dimensions after swaging. Dies
CR which do not produce the required dimensions shall
CR be rejected.

BALL TERMINALS AN663, AN664 OR MS EQUIVALENT			FORK, THREADED, AND EYE TERMINALS AN666, AN667, AN6681, AN669 OR EQUIVALENT MS			CYLINDRICAL TERMINALS HT100 OR BAC T14A		
CABLE DIAMETER	REQUIRED SHANK DIAMETER AFTER SWAGING		CABLE DIAMETER	REQUIRED SHANK DIAMETER AFTER SWAGING		CABLE DIA. 1	DIE SIZE 1	REQUIRED DIAMETER AFTER SWAGING
1/16	.112	+.000 -.003	1/16	.138	+.000 -.005	1/16	3/32	.190 .185
3/32	.143	+.000 -.003	3/32	.190	+.000 -.005	3/32	1/8	.219 .214
1/8	.190	+.000 -.003	1/8	.219	+.000 -.005	1/8	5/32	.250 .245
5/32	.222	+.000 -.004	5/32	.250	+.000 -.005	5/32	3/16	.313 .308
3/16	.255	+.000 -.005	3/16	.313	+.000 -.005	3/16	7/32	.375 .368
7/32	.302	+.000 -.005	7/32	.375	+.000 -.007			
1/4	.384	+.000 -.005	1/4	.438	+.000 -.007			
5/16	.413	+.000 -.005	5/16	.563	+.000 -.008			

1 DIE FOR NEXT LARGER SIZE ARE REQUIRED. USE SIZE SHOWN.

CR 4. Short Cable Section Installations

CR A. All non-standard short cable sections installed in a non
CR locksplad system shall be replaced at scheduled routine
CR cable changes with the standard cable configuration.

CR B. When a short cable section is installed in an aircraft, a
CR message shall be sent to MCI Inspection Dept. (MCIBI)
CR describing location and cable/system involved.

CR 5. Control Cables - Specification Limits - Airworthiness Inspection

CR Limitations as outlined below for Kansas City Aircraft Base
CR Maintenance and Maintenance Operations shall be used as a guide
CR in determining the airworthiness of all control cables on TWA
CR aircraft.

CR A. Kansas City Aircraft Base Maintenance

CR (1) 7 x 7 and 7 x 19 cables. Except Fuselage Cables - See
CR (3)

CR (a) Replace any cable which has worn to a point where
CR the individual wire strands on the worn side have
CR lost their identity. (See Figures 603, 604, and
CR 606). Cables worn only slightly, as indicated in
CR Figure 605, do not require replacement.

CR (b) Replace any cable having a broken wire in the area
CR that goes over a pulley. (See Figure 601).

CR (c) Replace any cable that is nicked or cut.

CR (d) Replace all cable assemblies damaged by rust or
CR corrosion.

CR (e) One single wire may be broken within a cable
CR assembly provided the broken wire is located in a
CR straight run portion of the cable assembly and
CR does not pass over a pulley, through a pressure
CR seal, or fairlead. The cable must meet the other
CR requirements of this section (See Figure 601).

CR (2) 1 x 19 Non-flexible cables

CR (a) Replace any cable which has worn to a point where
CR the individual wire strands on the worn side have
CR lost their identity. (See Figure 607).

CR (b) Replace any cable having a broken wire in the area
CR that goes over an idler pulley or through a
CR fairlead.

CR (c) Replace any cable that is nicked or cut.

CR (d) Replace any cable that has more than one broken
CR wire within a length of 10 feet.

CR (3) Fuselage Cables 7 x 7 and 7 x 19 Cables

CR NOTE: This section provides inspection limits for
CR MIL1011 cables inspected during base visits. 1 x
CR 19 cables are to have the limits of Paragraph
CR 5A(2) applied at the base visits.

CR (a) Replace all cables on which any one strand has the
CR individual wires worn such that a single wire
CR cross section is reduced by 40% or more.

CR (b) Replace any cable having a broken wire in the area
CR that goes over a pulley. (See Figure 601).

CR (c) Replace any cable that is nicked or cut.

CR (d) Replace all cables damaged by rust or corrosion.

CR (e) One single wire may be broken within a cable
CR assembly provided the broken wire is located in a
CR straight portion of the cable assembly and does
CR not pass over a pulley through a pressure seal, or
CR fairlead. The cable must meet the other
CR requirements of this section (See Figure Figure
CR 601).

CR B. Aircraft Field Maintenance

CR (1) 7 x 7 and 7 x 19 cables

CR (a) Replace any cable that has more than one wire broken where it goes over a pulley.

CR (b) Any cable that has one wire broken where it goes over a pulley (See Figure 601) must be recorded and reinspected at each Check "C".

CR (c) Any cable which has worn to a point where the individual wires have lost their identity (see Figures 603, 604 and 606) must be recorded and reinspected at each Check "C".

CR (2) 1 x 19 Nonflexible cables

CR (a) Replace any cable that has a broken wire in the section which passes through a fairlead or over a pulley fairlead.

CR (b) Replace any cable that has more than one broken wire within a length of 10 feet.

CR 6. Special Cable Inspections

CR A. At certain Check "C's" special cable inspections are performed.

CR (1) These special checks will be performed as scheduled thru Check "C" package.

CR (2) Inspect cables at these checks per base standards (5.A. preceding).

CR (3) At all other Check "C's" cables shall be inspected per Maintenance Standards (5.B. preceding).

CR 7. Check Associated Control Cable Hardware

CR A. Check that cables do not contact pulley or quadrant flanges for total of cable travel.

CR B. Check that cables lie within two degrees of plane of pulley or quadrant.

CR C. Check that cables are not deflected by fairleads, rug strips, air pressure seals, or grommets from rigged or normal operating position.

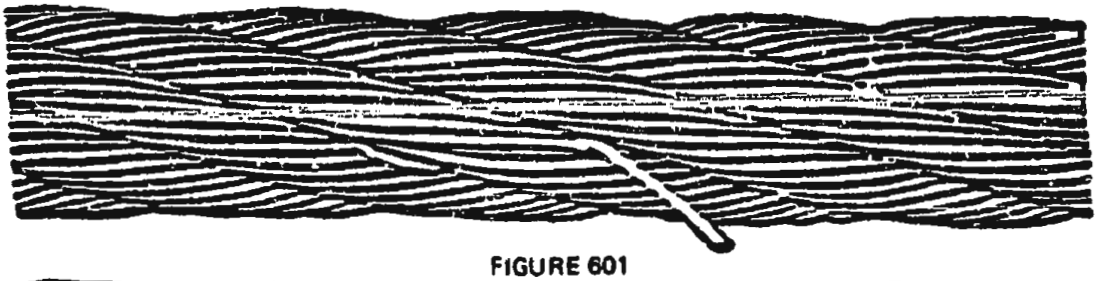


FIGURE 601

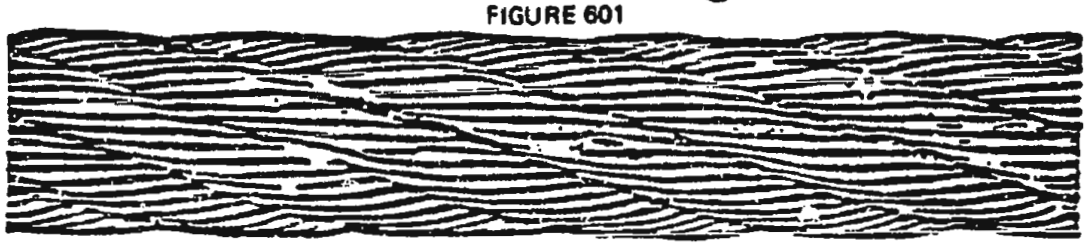


FIGURE 602

FIGURE 603

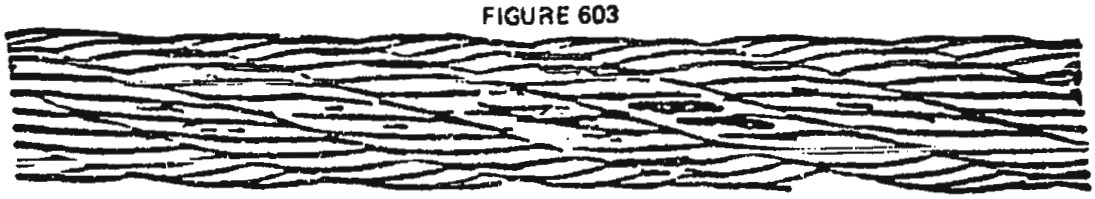


FIGURE 604

FIGURE 605

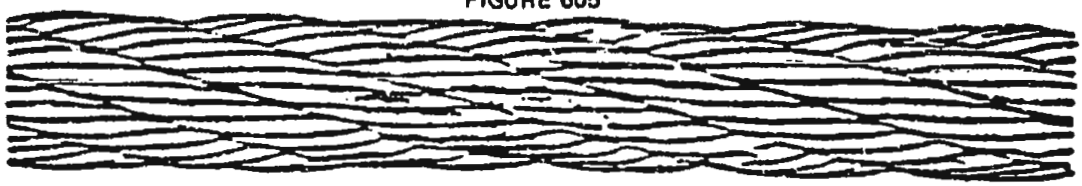


FIGURE 606

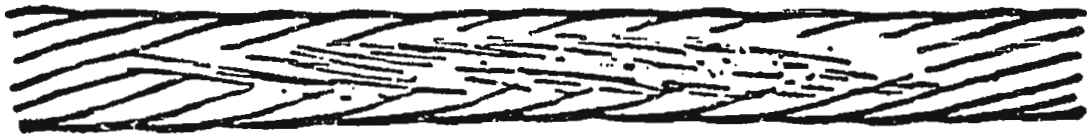


FIGURE 607

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CR
CR

Cable Damage - Inspection
Figures 601-607

R EFFECTIVITY: ALL
R
001B

CR 8. Control Cables - Installation

CR A. After installation in the aircraft system, control cables
CR will be prestretched by applying twice the normal tension
CR load and then cycling the system as described in
CR installation procedures.

CR 9. Control Cable Pulleys - Specification Limits

CR A. Four general types of control pulleys are installed on TWA
CR aircraft. The four types and their applicable uses are as
CR follows:

CR (1) Phenolic pulleys - for general use

CR (2) Aluminum pulleys - for fire resistant applications

CR (3) Stainless steel and high temperature aluminum pulleys -
CR for fire-proof requirements.

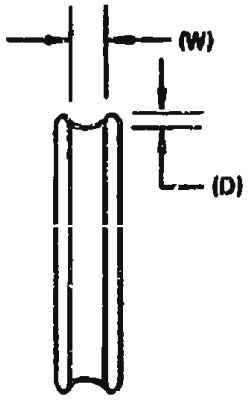
CR (4) Hardened one-piece all-steel pulleys - for use in high
CR temperature and restricted areas.

CR NOTE: The Parts Catalog nomenclature for this type
CR pulley is "bearing".

CR 10. Limitations

CR The following Table 602, which indicates the normal groove width
CR (dimension "W") of pulleys used with certain cable sizes, shall
CR be used as a guide in determining that the maximum allowable
CR depth of pulley groove wear (indicated by dimension "D") is not
CR exceeded.

CABLE SIZE	NORMAL GROOVE WIDTH (W)	MAX. GROOVE WEAR DEPTH (D)
1/16 TO 3/32	1/8	3/16
1/8 TO 3/16	1/4	5/16
3/16 TO 1/4	5/16	7/16



R

STANDARD PRACTICES - FUEL SYSTEM

R 1. General

R Standard practices pertaining to the fuel system is contained in
R this section.

APPLICATION OF FUEL VAPOR BARRIER COATING AND WING-PYLON INTERFACE SEALING

1. SCOPE

* 1.1 This bulletin establishes materials and procedures to be used in application of fillet and brush sealant and of fuel vapor barrier coating for the Model L-1011 aircraft for specific areas, as defined in this document.

1.2 Application of fillet and injection sealant shall be accomplished only after the fluid soak test has been accomplished on the outer wings and application of the sealant and vapor barrier coating shall be accomplished on the center wing box fuel tank only after the air pressure test.

2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issue in effect on date of contract or purchase order, form a part of this bulletin to the extent specified herein:

Federal	
TT-M-261	Methyl Ethyl Ketone, Inhibited
Military	
MIL-T-81533	Trichloroethane 1, 1, 1, Inhibited
Lockheed	
LCM32-1086	Cleaner, Petroleum Base, Non-Photochemically Reactive
LCM32-1087	Cleaner, Petroleum Base, for Primed Metals, Non-Photochemically Reactive
LCM40-2180	Compound, Sealing, Integral Fuel Tank
F875-424	Sealing of Integral Fuel Tanks Model L-1011

2.2 The following commercial materials, covered by the Lockheed Engineering Purchasing Specifications (EPS) Manual, form a part of this bulletin to the extent specified herein.

Material	EPS Number
Fuel Vapor Barrier Coating	40.3510
Thinner, Fuel Vapor Barrier Coating	40.3509
Safety Solvent, Non-Halogenated	41.4010

3. REQUIREMENTS

3.1 Material requirements. - Only those materials specified herein shall be used in the process covered by this bulletin.

3.2 General requirements

* 3.2.1 The wing pylon areas require only injection and fillet sealing and are shown in Figures 1 and 2. The upper surfaces of the center wing box fuel tank shall be injection, fillet and brush sealed and shall be coated with the vapor barrier material as shown in Figures 3 and 4. The sealant shall be applied after all finishes have been applied and cured.

3.2.2 Surface preparation. - All surfaces to which sealant or vapor barrier coating is to be applied shall be thoroughly cleaned by wiping with clean rags dampened with cleaners conforming to TT-M-261, MIL-T-81533, LCM32-1086 or LCM32-1087. Do not use the MIL-T-81533 Trichloroethane on titanium fittings or basic titanium structure. Prior to solvent evaporation, the surface shall be dried by wiping with clean rags.

NOTE: Use only Safety Solvent (EPS 41.4010) for cleaning titanium surfaces in Bldg. 601, Plant 10.

3.2.3 All titanium surfaces to which the vapor barrier coating is to be applied, other than countersunk fastener heads, shall be coated with one brush coat of LCM40-2180 Type II sealant prior to application of fuel vapor barrier coating.

CAUTION: Due to adhesion problems, the coating system should not be applied to titanium structure beyond the area necessary to cover the fillets and fasteners (see Figure 5).

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3.3 Sealing (see 1.2)

3.3.1 Wing pylon area. — In the areas shown in Figures 1 and 2, apply LCM40-2180 Type I sealant by injection to fill all cavities or voids and fillet seal all joints and fitting attachment interfaces.

* 3.3.2 Center wing box. — In the area shown in Figure 3 for the L-1011 -100 and in Figure 4 for the L-1011 -500 and -250, apply LCM40-2180 Type I sealant by injection to fill all voids and fillet seal all joints and fitting attachment interfaces. All protruding head fasteners and collars in this area shall be brush coated with LCM40-2180 Type II sealant. Figure 5 shows typical sealant and coating applications. The sealant shall cure to a tack free condition prior to vapor barrier coating application.

3.4 Application of fuel vapor barrier system (center wing box).

NOTE: The coating material is basically to be applied to the exterior surface of primary fuel barrier structure and to other structure that forms a faying surface joint with that barrier. Therefore, on legs and clips that extend away from the fuel barrier, the coating material need extend only a minimum of 1/4 inch beyond the LCM40-2180 sealant applied at the faying surface joints as shown in Figure 5.

3.4.1 Mixing and handling of vapor barrier coating material. — The fuel vapor barrier coating (EPS 40.3510) shall be mixed using a ratio of 6.9 grams catalyst per 100 grams of base material. If accurate scales are not available for weighing the material, complete kits shall be mixed. Mix only the amount of material that will be used within the application life of the mixed coating material, 45 minutes at 70°F measured from start of mixing. If thinning is required for application of coating, use EPS 40.3509 thinner up to a maximum of 15% by volume.

* 3.4.2 Using either brush or spray equipment, apply a sufficient number of coats of the mixed coating material to result in a cured film thickness of 0.010 inch minimum. The coating should be applied in multiple coats in order to minimize solvent entrapment and bubble formation. Allow a minimum of 30 minutes air dry between coats to permit solvent flash-off. The material will dry to handle in one hour.

* 3.4.3 The vapor barrier coating shall completely cover the areas designated in Figures 3 and 4 on the different series aircraft. The coating shall be continuous in the specified areas and shall be free of cracks, pinholes, or voids. Minor internal bubbles and runs in the coating are permissible.

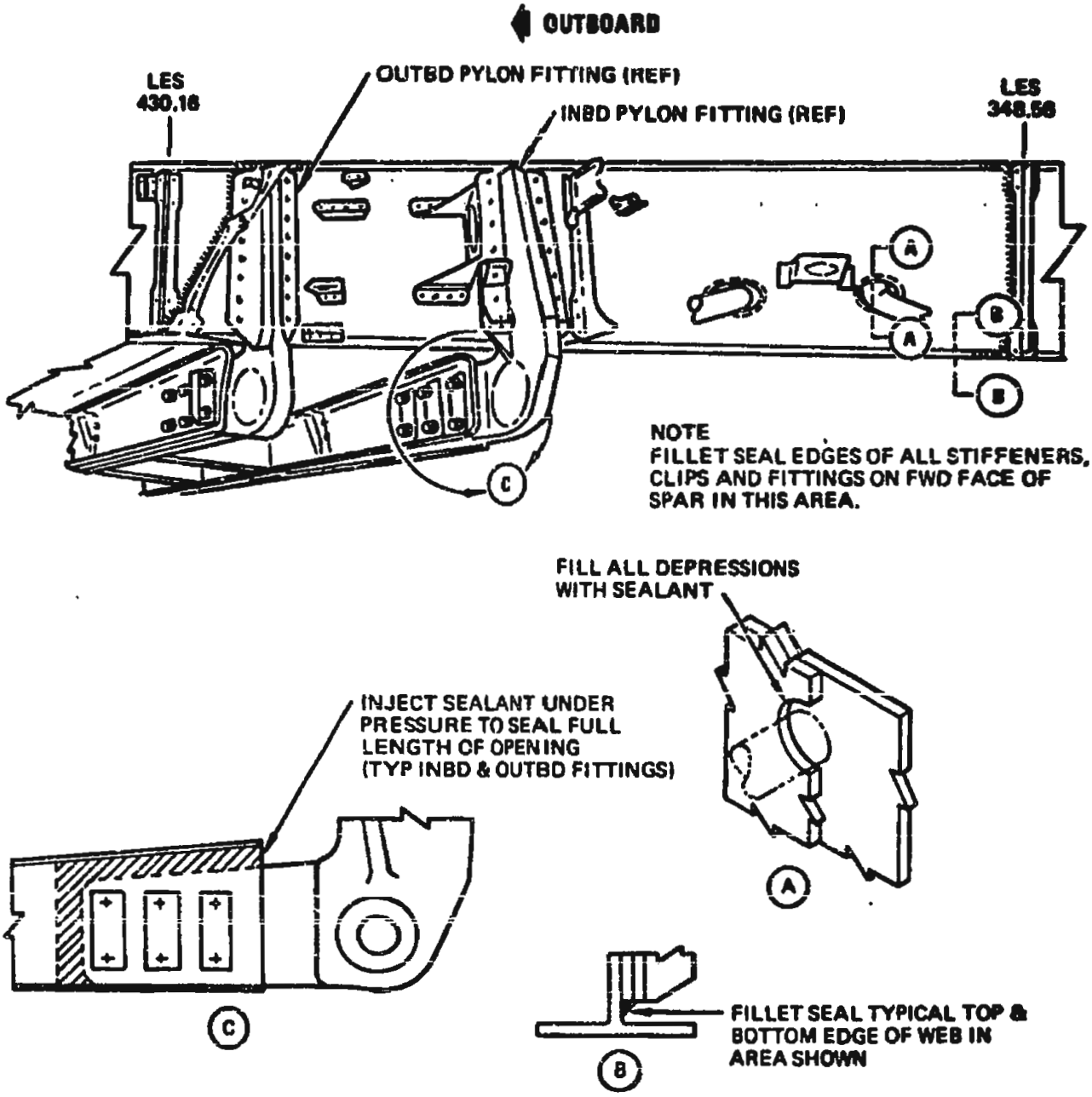
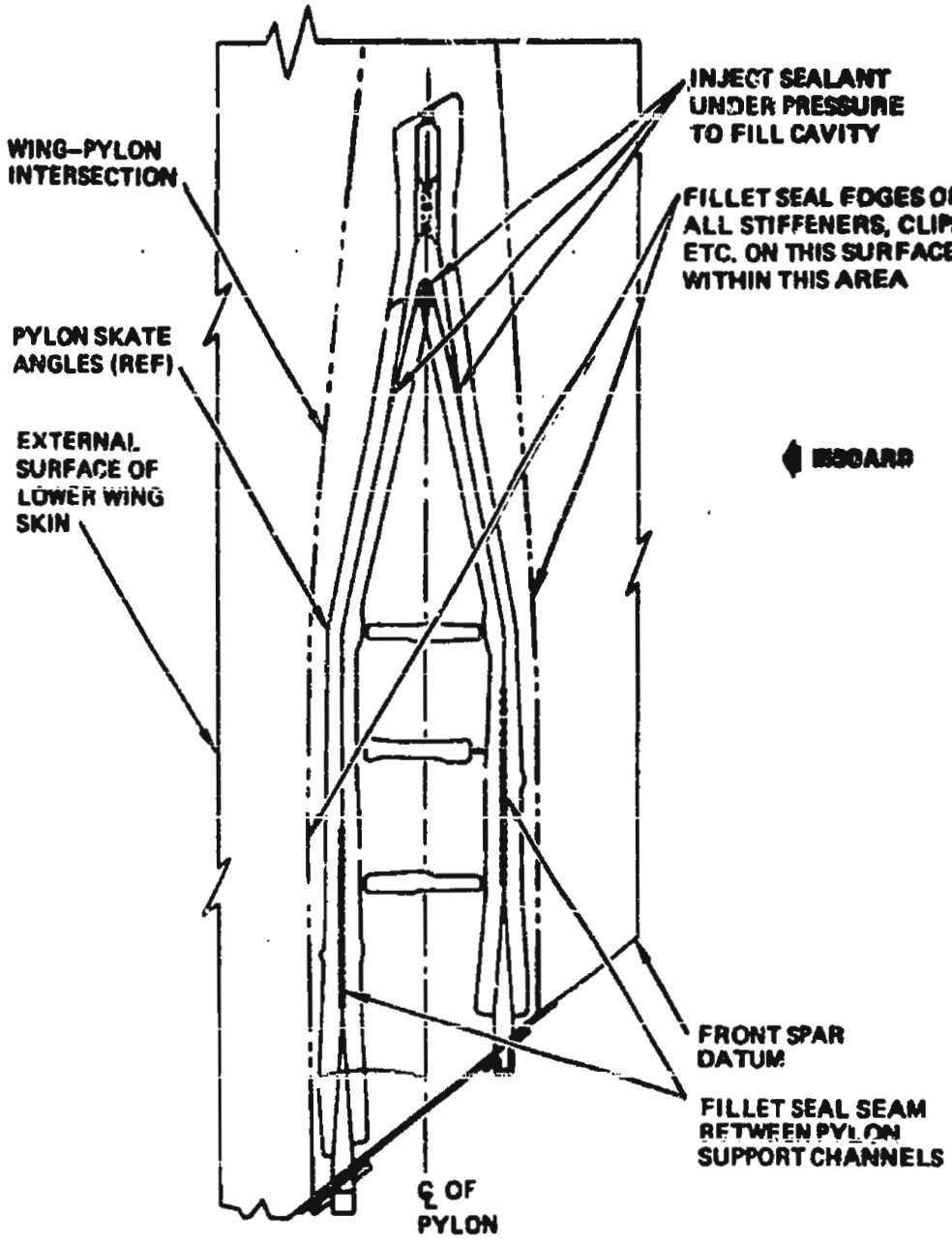


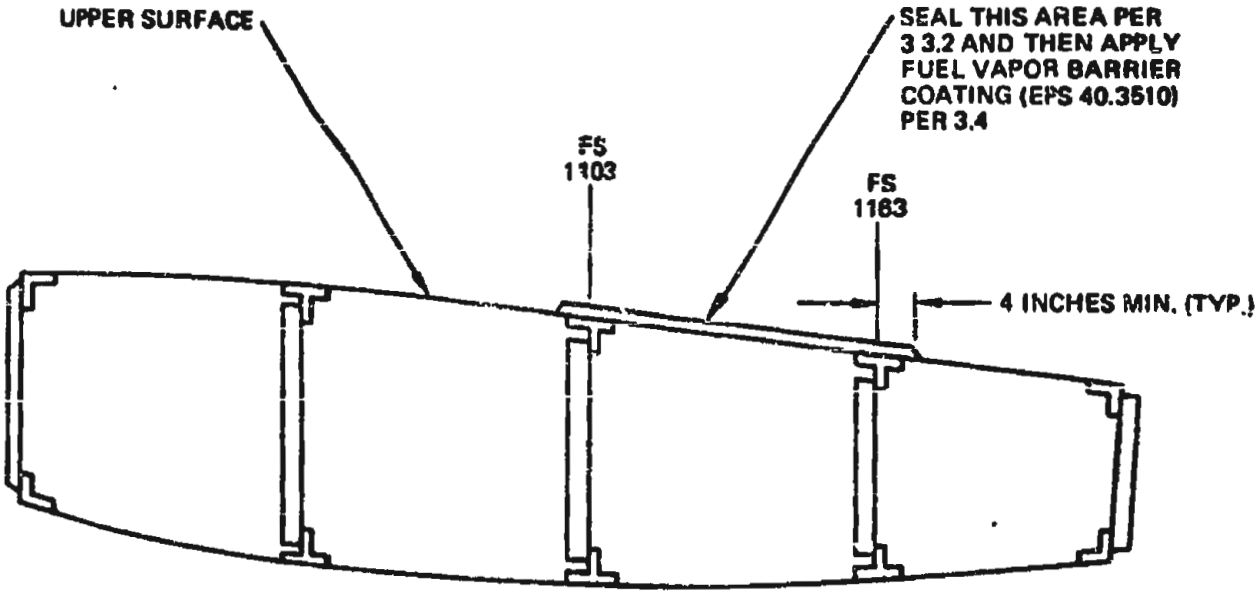
FIGURE 1 · APPLICATION OF FILLET AND INJECTION SEALING, PYLON AREA · FRONT SPAR

M1–0100–28–1234


INJECT SEALANT UNDER PRESSURE TO FILL CAVITY
WING–PYLON INTERSECTION
FILLET SEAL EDGES OF ALL STIFFENERS, CLIPS, ETC. ON THIS SURFACE WITHIN THIS AREA
PYLON SKATE ANGLES (REF)
EXTERNAL SURFACE OF LOWER WING SKIN
INBOARD
FRONT SPAR DATUM
FILLET SEAL SEAM BETWEEN PYLON SUPPORT CHANNELS
℄ OF PYLON

APPLICATION OF FILLET AND INJECTION SEALING, PYLON AREA-LOWER WING SURFACE.
FIGURE 2

M1-0001-28-1235


UPPER SURFACE
SEAL THIS AREA PER 3 3.2 AND THEN APPLY FUEL VAPOR BARRIER COATING (EPS 40.3510) PER 3.4
FS 1103
FS 1163
4 INCHES MIN. (TYP.)

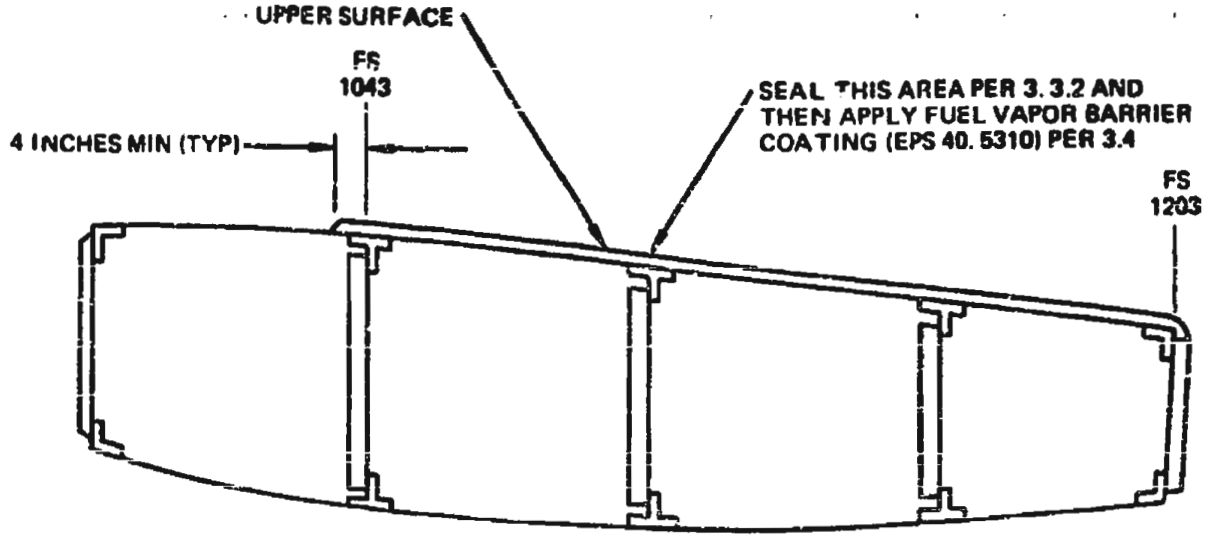
SEAL ALL JOINTS AND FASTERNERS ON DRY SIDE

NOTE

ON UPPER SURFACE THE COATING SHALL BE APPLIED OUTBOARD TO COVER THE BL 116 L AND R SPLICE PLATE INCLUDING FUSELAGE ATTACHING TEE.

APPLICATION OF FUEL VAPOR BARRIER COATING ON CENTER WING BOX FUEL TANK
MODEL L-1011, FIGURE 3 (20-28-3)

M1-0100-28-1236



SEAL ALL JOINTS AND FASTENERS ON DRY SIDE.

NOTE
ON UPPER SUFRACE THE COATING SHALL BE APPLIED OUTBOARD TO COVER THE BL 116 L AND R SPLICE PLATE INCLUDING FUSELAGE ATTACHING TEE.

APPLICATION OF FUEL VAPOR BARRIER COATING ON CENTER WING BOX FUEL TANK, MODELS L-1011-500 AND L-1011-250, FIGURE 4 (20-28-03)

M1 -0100-28-1237

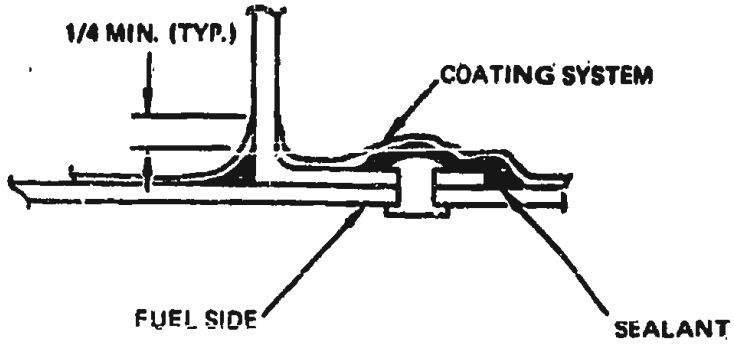


FIGURE 5 – TYPICAL SEALANT AND COATING APPLICATIONS

4 QUALITY ASSURANCE PROVISIONS

4.1 Sufficient surveillance shall be exercised to ensure compliance with the requirements of this bulletin.

5. HANDLING AND STORAGE

5.1 Parts shall be handled and transported in such a manner as will ensure that the required physical characteristics and properties are preserved.

6. NOTES

6.1 There is no Government specification covering requirements of this bulletin.

6.2 This revision supersedes PB75-518B dated 4-16-75 and Amendment No. 1 dated 11-5-75.

M1-0100-28-1238

R FUEL AND LUBRICATION LINES ASSEMBLY - MAINTENANCE PRACTICES

R 1. Equipment and Materials

R Torque Wrenches - 15 to 2500 pound-inch range as applicable

R Tamper-proof Putty - CEPS L37.6800

R 2. Maintenance Practices

R A. Dynatube Fittings

R (1) Tighten to torque values specified in Table 201 (Ref. R Fig. 201).

R CAUTION: DO NOT MARK COUPLINGS IN AREAS CONTAINING FLUID.

R (2) Mark coupling (if required) with tamper-proof putty.

R B. Straight Thread Fittings into Bosses

R (1) Tighten to torque values specified in Table 202 (Ref. R Fig. 201).

R C. Bulkhead Fitting Jam Nuts

R (1) Install washers on bulkhead fittings with small R shoulder area.

R NOTE: Bulkhead fittings with large hex shaped R shoulders do not require washers.

R (2) Tighten to torque values specified in Table 203 (Ref. R Fig. 201).

R D. Pipe Thread Fittings

R (1) Tighten pipe thread fittings to minimum torque values R specified in Table 204 or 205 (Ref. Fig. 201). If R leakage occurs, or if fitting positioning is rquired, R continue to tighten but do not exceed maximum torque R values.

R E. INSTALLATION PRACTICES

R (1) Prevent tubing preload as follows:

R (a) Install tubing assembly with tubing clamps R attached but untightened.

R (b) Seat tubing ends and install coupling nuts using
R finger pressure only; no tools permitted.

R (c) If the initial installation cannot be made with
R finger pressure alone, do not complete the
R installation but determine the cause of the
R misalignment. Correct misalignment as necessary.

R (d) Examine tubing clamps to determine if they can be
R tightened without causing misalignment. Install
R shims between tube clamp and surface as necessary.
R Do not tighten clamps.

R NOTE: Shims may be aluminum or phenolic.
R Aluminum shims must have the same finish as
R the supporting structure. The dimensions
R of the shim must not be less than the width
R and length of the clamp mounting surface
R and not thicker than 0.5 inch. Shim
R mounting hole must be the same diameter as
R the clamp mounting hole. Longer clamp
R attaching screws of the same type may be
R used as required.

R (2) Verify tubing meets minimum clearance requirements as
R follows. Adjust or modify tubing assembly as required:

R (a) Minimum clearance between fuel and lubrication
R tubes and adjacent structure is 0.125 inch.

R (b) Minimum clearance between fuel and lubrication
R tubes and electrical wiring, control cables or
R control rods is 0.5 inch.

R (c) Minimum clearance between fuel and lubrication
R tubes and hydraulic lines is 0.25 inch.

R (3) Tighten couplings and fittings to their required
R torque.

R (4) Tighten tubing clamps.

TUBE/FITTING SIZE INCH - DASH NO.	TORQUE (POUND-INCHES)		
	MINIMUM	NOMINAL	MAXIMUM
TABLE 201-DYNATUBE SWAGED OR WELDED FITTINGS			
1/4 O.D. - 4	120	144	168
5/16 O.D. - 5	132	156	180
3/8 O.D. - 6	180	240	300
1/2 O.D. - 8	360	420	480
5/8 O.D. -10	492	576	660
3/4 O.D. -12	600	720	840
1 O.D. -16	840	984	1128
1 1/4 O.D. -20	1000	1200	1440
TABLE 202-STRAIGHT THREAD FITTINGS INTO BOSSES			
3/16 O.D. - 3	65	-	75
1/4 O.D. - 4	95	-	105
5/16 O.D. - 5	125 DRY	-	135 DRY
3/8 O.D. - 6	155	-	165
1/2 O.D. - 8	280	-	305
5/8 O.D. -10	380	-	405
3/4 O.D. -12	550	-	600
1 O.D. -16	800	-	900
1 1/4 O.D. -20	950	-	1000
TABLE 203-BULKHEAD CONNECTOR JAM NUTS			
1/4 O.D. - 4	85	-	105
3/8 O.D. - 6	120	-	150
1/2 O.D. - 8	240	-	280
5/8 O.D. -10	320	-	380
3/4 O.D. -12	500	-	600
1 O.D. -16	720	-	880
1 1/4 O.D. -20	960	-	1200
TABLE 204-PIPE THREAD FITTINGS (EXCEPT OXYGEN)			
1/8 PIPE THREAD -	40	-	300
1/4 PIPE THREAD -	60	-	600
3/8 PIPE THREAD -	75	-	700
1/2 PIPE THREAD -	100	-	900
3/4 PIPE THREAD -	300	-	1600
1 PIPE THREAD -	400	-	2200
1 1/4 PIPE THREAD -	500	-	2500
TABLE 205-OXYGEN SYSTEM PIPE THREAD FITTINGS			
1/8 PIPE THREAD -	40	-	150
1/4 PIPE THREAD -	60	-	200
3/8 PIPE THREAD -	100	-	400

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R
R

Torque Values
Figure 201

R EFFECTIVITY: ALL
R
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CR

FUEL FEED LINES - INSPECTION/CHECK

CR 1. General

CR The following inspection and check is used as a criteria in
CR determining the serviceability of damaged fuel feed line
CR assemblies.

CR 2. Inspection/Check

CR A. Stainless Steel Fuel Feed Lines

CR NOTE: The No. 1 and No. 3 engine pylon fuel feed lines have
CR additional and more stringent requirements (Ref.
CR 28-24-00/601).

CR (1) Replace fuel feed line assemblies when an inspection
CR reveals the following damage:

CR (a) A dent within 2 inches of the tube ends,
CR weldments, or fittings that exceeds 0.030 inch in
CR depth.

CR (b) Any two dents that are closer than 3 times the
CR width of the larger dent that do not exceed 0.060
CR inch in depth.

CR (c) A smooth dent, that is free of cuts, the depth of
CR which exceeds 10 percent of tube outside diameter
CR for tubes up to and including 2 inches, or exceeds
CR 5 percent of tube outside diameter for tubes over
CR 2 inches.

CR (d) A dent the length or width of which exceeds 1.250
CR inch.

CR NOTE: The radius at the bottom of any dent that
CR is otherwise considered acceptable must be
CR greater than 0.031 inch.

CR (2) A line that has any wear, chafing, scratches, notches,
CR or gouges that exceed 0.010 inch in depth must be
CR replaced; depths of 0.010 inch or less are serviceable
CR if burnished out to a length 10 times the depth.

CR B. Aluminum Fuel Feed Lines

CR (1) Replace fuel feed line assemblies when an inspection
CR reveals the following damage:

CR (a) A dent within 2 inches of the tube ends, weldments, or fittings that exceeds 0.030 inch in depth.

CR (b) Any two dents that are closer than 3 times the width of the larger dent that do not exceed 0.060 inch in depth.

CR (c) A smooth dent, that is free of cuts, the depth of which exceeds 10 percent of tube outside diameter for tubes up to and including 2 inches, or exceeds 5 percent of tube outside diameter for tubes over 2 inches.

CR (d) A dent the length or width of which exceeds 1.250 inch.

CR NOTE: The radius at the bottom of any dent that is otherwise considered acceptable must be greater than 0.031 inch.

CR (2) A line having any wear, chafing, scratches, notches, or gouges that exceed 0.005 inch in depth must be replaced. Depths of 0.005 inch or less are serviceable if burnished out to a length 10 times the depth.

CR

FUEL FEED LINES - APPROVED REPAIRS

CR 1. General

CR Refer to 20-29-02/801, Para. 1.G.(7) for Optional Tubing Weld
CR Repairs.

CR

FUEL FEED LINE SHROUD - APPROVED REPAIRS

CR 1. General

CR A. The fuel feed shrouds covered in this section are the rigid
CR shrouds covering the fuel feed lines.

CR 2. Limits

CR A. Dents may not exceed 2.5 inches in length and .37 inch in
CR depth.

CR B. Chafed areas may not exceed 1/2 square inch where no hole
CR exists.

CR C. Cracks may not exceed 1 inch in length.

CR D. Holes may not exceed 1/4 inch diameter.

CR 3. Materials

CR A. Fiberglass cloth : MFG P/N 181

CR B. Adhesvie : MFG P/N EC 2216

CR 4. Repair

CR A. All damaged areas must be dye penetrant checked.

CR CAUTION: USE DRILL STOP TO PREVENT DAMAGE TO FUEL LINE.

CR B. If cracks exist, all cracks must be stop drilled with 1/8
CR inch drill.

CR C. Apply two plies of 181 fiberglass cloth to damaged area per
CR standard procedure.

CR NOTE: Fiberglass cloth must extend 2 inches from farthest
CR edges of damage and cover the entire diameter of the
CR shroud.

CR D. Use adhesive P/N EC 2216 to bond fiberglass cloth to the
CR shroud. Allow adhesive to cure before applying pressure to
CR shroud.

CR 5. Check

CR A. Leak check shroud (Ref. Chapter 28).

CR

FUEL FEED LINE SHROUD - APPROVED REPAIRS

CR 1. General

CR A. The fuel feed shrouds covered in this section are the CR flexible shrouds covering the fuel feed lines.

CR 2. Limits

CR A. The length of cuts and tears shall not exceed 1 inch CR longitudinal or 25% of shroud/duct circumference.

CR B. Chafed or worn areas where no hole is evident may not exceed CR 1/2 square inch.

CR C. Holes or punctures may not exceed 1/4 inch diameter.

CR 3. Materials

CR A. Fiberglass cloth : MFG P/N 181

CR B. Adhesive : MFG P/N 1422A-1/2

CR 4. Repair

CR A. Apply two plies of 181 fiberglass cloth to damaged area per CR standard procedure.

CR NOTE: Fiberglass cloth must extend 2 inches from farthest CR edges of damage and cover the entire diameter of the CR shroud.

CR B. Use adhesive P/N 1422A-1/2 or equivalent to bond fiberglass CR cloth to shroud. Allow adhesive to cure before applying CR pressure to shroud.

CR 5. Check

CR A. Leak check shroud (Ref. Chapter 28).

STANDARD PRACTICES - FLUID LINES AND FITTINGS

1. General

CR Standard practices pertaining to the fluid lines and fittings used in the hydraulic power, fuel, oxygen and water/waste systems are contained in this section.

R FLUID LINES AND FITTINGS ASSEMBLY - MAINTENANCE PRACTICES

R 1. Equipment and Materials

R Torque Wrenches - 15 to 2500 pound-inch range as applicable

R Coupling Marking Paint - LCM37-1035 Primer Coating, Epoxy,
R Phosphate Ester Resistant or equivalent

R Tamper-proof Putty - CEPS L37.6800

R 2. Maintenance Practices

R A. Dynatube Fittings

R (1) Tighten to torque values specified in Table 201 (Ref.
R Fig. 201).

R (2) Mark coupling of hydraulic system lines with LCM37-1035
R primer coating.

R (3) Mark coupling (if required) of systems other than
R hydraulic with tamper-proof putty.

R NOTE: Do not mark couplings in oxygen system or in
R areas containing fluid.

R B. Straight Thread Fittings into Bosses

R (1) Lubricate threads with hydraulic fluid (no lubricant
R for oxygen system fittings).

R (2) Tighten to torque values specified in Table 202 (Ref.
R Fig. 201).

R C. Bulkhead Fitting Jam Nuts

R (1) Bulkhead fittings with small shoulder areas require
R washer installation (Ref. Fig. 202).

R (2) Tighten to torque values specified in Table 203 (Ref.
R Fig. 201).

R D. Pipe Thread Fittings

R (1) Tighten pipe thread fittings to minimum torque values
R specified in Table 204 or 205 (Ref. Fig. 201). If
R leakage occurs, or if fitting positioning is required,

continue to tighten but do not exceed maximum torque values.

E. Hose Clamps

(1) Non self-sealing hose: maximum torque - 25 pound-inches.

(2) Self-sealing hose and lines open to atmosphere (de-icer and drain lines): maximum torque - 15 pound-inches.

F. Tubing and Fitting Installation Practices

(1) Maintain adequate clearance while clamping tubes routed through structure openings (Ref. Fig. 202).

(2) Tube clamps must not be installed with tube under tension that would cause clamp pad to shift or extrude from clamp (Ref. Fig. 202).

(3) Grommet installation must be such that grommet material will not be subjected to damage (Ref. Fig. 202).

(4) Tubes secured next to moving components shall maintain minimum clearance (1/4-inch) at point of greatest travel of the moving component (Ref. Fig. 202).

R (5) Where tubes are secured to structure or other rigid
R members, maintain a minimum clearance of 0.06 inch. At
R locations between supports, tubes must maintain a
R minimum clearance of 0.25 inch with surrounding
R structure and components.

TUBE/FITTING SIZE INCH - DASH NO.			TORQUE (POUND-INCHES) MINIMUM	NOMINAL	MAXIMUM
TABLE 201-DYNATUBE SWAGED OR WELDED FITTINGS					
1/4	O.D.	- 4	120	144	168
5/16	O.D.	- 5	132	156	180
3/8	O.D.	- 6	180	240	300
1/2	O.D.	- 8	360	420	480
5/8	O.D.	-10	492	576	660
3/4	O.D.	-12	600	720	840
1	O.D.	-16	840	984	1128
1 1/4	O.D.	-20.	1080	1260	1440
TABLE 202-STRAIGHT THREAD FITTINGS INTO BOSSES					
3/16	O.D.	- 3	65	-	75
1/4	O.D.	- 4	95	-	105
5/16	O.D.	- 5	125 DRY	-	135 DRY
3/8	O.D.	- 6	155	-	165
1/2	O.D.	- 8	280	-	305
5/8	O.D.	-10	380	-	405
3/4	O.D.	-12	550	-	600
1	O.D.	-16	800	-	900
1 1/4	O.D.	-20	900	-	1000
TABLE 203-BULKHEAD CONNECTOR JAM NUTS					
1/4	O.D.	- 4	85	-	105
3/8	O.D.	- 6	120	-	150
1/2	O.D.	- 8	240	-	280
5/8	O.D.	-10	320	-	380
3/4	O.D.	-12	500	-	600
1	O.D.	-16	720	-	880
1 1/4	O.D.	-20	960	-	1200
TABLE 204-PIPE THREAD FITTINGS (EXCEPT OXYGEN)					
1/8	PIPE THREAD	-	40	-	300
1/4	PIPE THREAD	-	60	-	600
3/8	PIPE THREAD	-	75	-	700
1/2	PIPE THREAD	-	100	-	900
3/4	PIPE THREAD	-	300	-	1600
1	PIPE THREAD	-	400	-	2200
1 1/4	PIPE THREAD	-	500	-	2500
TABLE 205-OXYGEN SYSTEM PIPE THREAD FITTINGS					
1/8	PIPE THREAD	-	40	-	150
1/4	PIPE THREAD	-	60	-	200
3/8	PIPE THREAD	-	100	-	400

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R
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Torque Values
Figure 201

EFFECTIVITY: ALL

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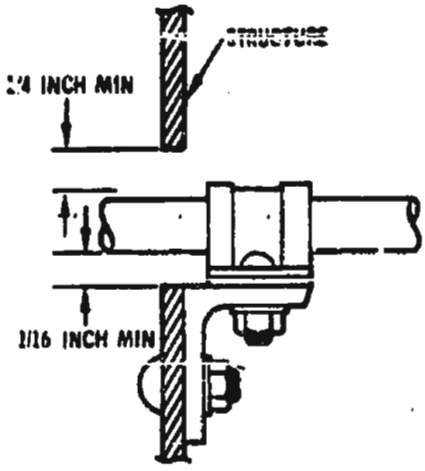
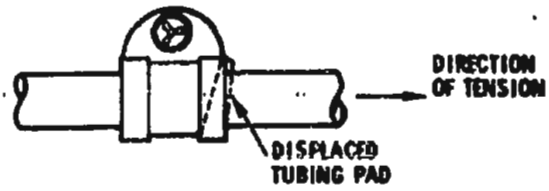
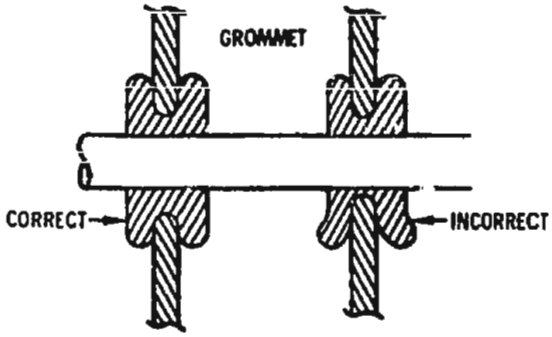


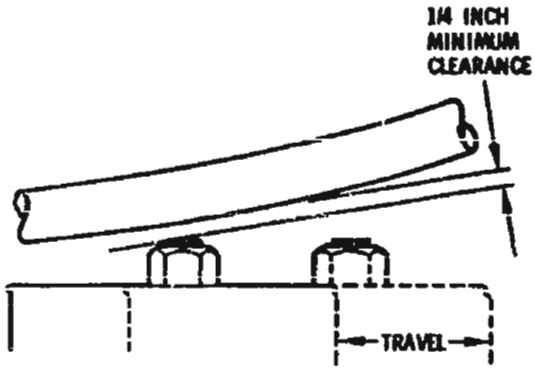
TUBE CLEARANCE REQUIRED FOR SUPPORT CLAMP INSTALLATION



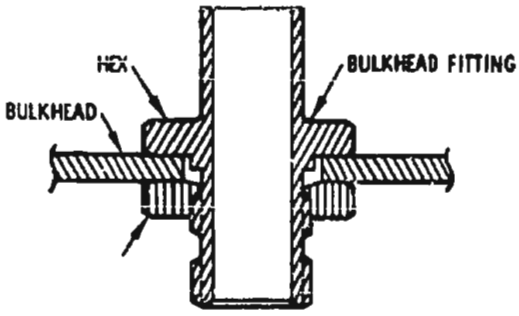
SUPPORT CLAMP INSTALLATION TUBING TENSION EFFECT



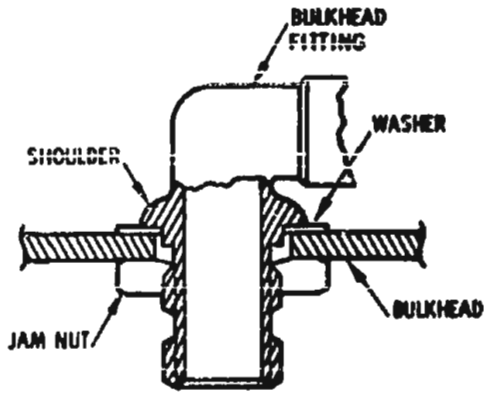
GROMMET INSTALLATION



TUBE CLEARANCE NEAR MOVING COMPONENTS



HEX SHOULDER (NO WASHER REQUIRED)



SMALL AREA SHOULDER (WASHER REQUIRED)

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Tubing and Fitting Installation Practices
Figure 202

FLUID LINES AND FITTINGS - INSPECTION AND CHECK

1. General

The following guidelines provide allowable limits and repair requirements for hydraulic tubing damage and wear.

2. Inspection/Check

A. Dents

Dents are allowable in hydraulic tubes if the following requirements are met.

(1) The dent may not restrict the flow in the tube.

(2) The radius of the dent may not be less than wall thickness plus 0.06 inch for 21-6-9 stainless steel tubing and four times wall thickness for 6061-T6 aluminum alloy tubing.

(3) Do not attempt to remove dent from tubing.

(4) The length or width of the dent may not be more than 1/3 of the tube outside diameter (O.D.).

(5) No dents are permitted within 1-1/2 inches of the tube ends, weldments, formed transitions, fittings, etc.

R R (6) Depth of dents may be no greater than five percent of the tube outside diameter.

(7) Any scratches or nicks in the dented areas, within the limits of Table 601, must be repaired in accordance with Paragraph C.

R (8) No two dents or other damages may be closer together than three times (3X) the width of the larger damage.

B. Scratches, Nicks, and Wear

Scratches, nicks, and worn areas may be reworked if damage is not beyond allowable limits shown in Table 601. If damage is not within limits, replace tubing. Rework of worn areas is not required if transition is smooth from damaged to undamaged area and wall reduction does not exceed limits.

CAUTION: DAMAGE IN EXCESS OF THE LIMITS SPECIFIED IN TABLE 601 MAY RESULT IN SEVERELY REDUCED TUBE LIFE. LIMITED OPERATION IN EXCESS OF THESE LIMITS SHOULD BE BASED UPON THE JUDGEMENT OF THE OPERATOR.

R C. Quality at bends

R Tubing with excessive flattening at bends will have an unacceptable fatigue life. Refer to Table 601 for limits on acceptable tubing quality. Limits indicate maximum outside diameter reduction.

R 21-6-9 Steel High Pressure Tubing Quality Limits
Table 601

DIAMETER (INCH)	WALL THICKNESS (INCH)	PRODUCTION LIMIT	SERVICE LIMIT
1/4 O.D.	.016	.020 INCH	20%
*5/16 O.D.	.020	.020 INCH	20%
3/8 O.D.	.028	5%	20%
3/8 O.D.	.020	5%	10%
1/2 O.D.	.026	5%	10%
5/8 O.D.	.033	5%	10%
3/4 O.D.	.039	5%	10%
1 O.D.	.052	5%	10%

*Oxygen only

R Reduction of tube life will depend on the degree of flattening involved. Operation with tubing beyond service limits should be based on judgement of the operator.

R D. Repair of Hydraulic System Tubing

Repair of both high and low pressure hydraulic system tubing consists mainly of repairing scratches, nicks, and wear R spots. Table 602 gives the maximum allowable wall reduction limits. The tube wall reduction allowable is permitted at any location on the tube.

(1) Blend damaged area so that the damage is removed with a minimum blending radius of one inch.

(2) Taper the damaged area to the original wall thickness over a distance of twenty times the damage depth.

(3) Dye check the reworked area to make sure that no cracks are left in tube.

(4) Alodine reworked area on all aluminum alloy tubing.

NOTE: Stainless steel tubing does not require finish applications after rework.

TUBE DATA					DEPTH OF DAMAGE/WEAR
DASH NO.	TUBE OD (IN.)	WALL THICKNESS	MATERIAL	HYD. FUNCTION	
-4	1/4	.016	21-6-9 CRES	HIGH PRESSURE – 3000 PSI	.006
				RETURN	.006
-6	3/8	.020	21-6-9 CRES	HIGH PRESSURE – 3000 PSI	.007
				RETURN	.007
-8	1/2	.020	21-6-9 CRES	RETURN	.006
		.026	21-6-9 CRES	HIGH PRESSURE – 3000 PSI	.008
		.028	6061-T6 AL. ALY.	RETURN	.010
-10	5/8	.020	21-6-9 CRES	RETURN	.005
		.033	21-6-9 CRES	HIGH PRESSURE – 3000 PSI	.010
		.035	6061-T6 AL. ALY.	RETURN	.010
-12	3/4	.020	21-6-9 CRES	RETURN	.006
		.039	21-6-9 CRES	HIGH PRESSURE – 3000 PSI	.011
		.042	6061-T6 AL. ALY.	RETURN	.010
-16	1	.026	21-6-9 CRES	RETURN	.010
		.049	6061-T6 AL. ALY.	RETURN	.010
		.052	21-6-9 CRES	HIGH PRESSURE – 3000 PSI	.012
-20	1-1/4	.028	6061-T6 AL. ALY.	SUCTION	.010
		.032	21-6-9 CRES	RETURN	.012
		.032	21-6-9 CRES	SUCTION	.015
		.065	6061-T6 AL. ALY.	RETURN	.017

CAUTION:
DAMAGE IN EXCESS OF THE ABOVE MAY SEVERELY REDUCE TUBE LIFE. LIMITED OPERATION WITH EXCESSIVE DAMAGE SHOULD BE BASED ON JUDGEMENT OF THE OPERATOR.

M1–0102–20–010

Hydraulic System Tubing - Allowable Limits for Damage and Wear
Table 602

R

R EFFECTIVITY: ALL
R
001B

C FLUID LINES AND FITTINGS ASSEMBLY - REPAIR PROCEDURES

C 1. Introduction

C A. Fluid leakage from a tubing installation will usually be C found in a defective (1) reconnectable fitting assembly C and/or (2) tube run or section. Repair procedures and C general instructions for handling each of these conditions C will follow. However, the specific procedure to be used C will generally require the use of several parts of the C following instructions and will depend on the location and C configuration of the defective part or tube section.

C B. L1011 tubing systems incorporate the use of 21-6-9 C "thin-wall" corrosion-resistant (CRES) seamless steel tubing C in pressure lines and all those exposed to critical C environmental conditions such as in the wheel wells, landing C gears and power plant fire zones; the use of 6061-T6 C aluminum alloy tubing in medium and low pressure C applications; and the use of the DYNATUBE coupling assembly C for reconnectable joints.

C C. The 21-6-9 CRES seamless tubing and the 6061-T6 aluminum C alloy tubing is identical to tube installations in TWA's C Boeing 747 aircraft. Handling procedures for these tube C materials will be the same for the 747 and the L1011 C aircraft.

C D. The DYNATUBE coupling assembly includes a metal-to-metal C seal on the mating surfaces that uses an integral C Belleville-washer type diaphragm in the female half to make C a seal at a low torque value. Each DYNATUBE coupling C consists of a male and female fitting. The female fitting C half is also designated as a nut-and-shoulder assembly - the C same general parts configuration as the B-nut and the sleeve C in the MS-flareless fitting assembly. The DYNATUBE coupling C is NOT INTERCHANGEABLE in any manner with the MS-flareless C design fitting installed in all other TWA fleet aircraft C systems. Refer to Figure 802 for coupling detail.

C E. The H-Coupling Assembly (Boeing Standard BAC C42W) can be C effectively used to replace tube defects or to join tube C repair sections and requires no special tools for C installation. Refer to Paragraph 8 for detailed C installation instructions.

C F. The following guidelines can be used to determine the type C of repair required for correcting a fluid leakage condition C in a L1011 tubing installation:

C (1) Decide whether the source of leakage is in the DYNATUBE coupling assembly or in the tubing section.

C (2) Repair or replacement of the DYNATUBE coupling assembly will be accomplished as directed in Paragraph 4.A, 4.B and 4.D.

C (3) Repair or replacement of the tubing section will be accomplished as directed in Paragraphs 4.C, 4.D and 7.

C CAUTION: SWAGED TUBE FITTINGS ARE NOT APPROVED FOR REPAIRS ON POTABLE WATER SYSTEM TUBING. THE CONNECTORS CONTAIN CAVITIES THAT WILL ENTRAP CONTAMINANTS. SWAGED FITTINGS ARE NOT TO BE USED FOR REPAIRS ON FLEXIBLE COILED HYDRAULIC LINES.

C G. In the event of a metal tube failure or a localized tube defective area, an airworthy repair may be accomplished by using one of the following procedures:

C (1) Replace the damaged section with a repair using the Boeing Standard BAC C42W Repair Fitting (also known as the H-Coupling Assembly) as described in Paragraph 8.

C (2) Replace the damaged tubing assembly with the identical part number assembly or an assembly locally fabricated from the proper type tubing material and MS-flareless type end fittings.

C (3) Remove the damaged section from the tube assembly and replace with a splice tube section, a MS21902 Union fitting or a MS21924 Bulkhead Union fitting. Refer to Paragraph 4.C and 7 following for specific details.

C (4) Remove the damaged section from the tube assembly and replace with a splice tube section of the same material and Dynatube fittings. Refer to Paragraph 4.D following for specific details.

C (5) Replace the damaged tubing assembly or the defective section in the assembly with a HIGH-PRESSURE hose assembly of the proper part number for fire-resistant hydraulic fluid use. If only the defective section in the airframe assembly is removed, prepare the open ends of the airframe tube in the same manner as specified in Paragraph 4.C.

C CAUTION: NEVER INSTALL A MEDIUM PRESSURE HOSE ASSEMBLY

C IN A HIGH PRESSURE APPLICATION. ALL HOSE
C ASSEMBLIES MUST BE PREVENTED FROM CHAFING ON
C ADJACENT STRUCTURE TUBING, OR UNITS.
C ADEQUATE CLEARANCE WITH OPERATING UNITS MUST
C BE MAINTAINED.

C (a) When a damaged metal tube section is replaced with
C a hose assembly, a write-up of this action shall
C be entered in the aircraft log.

C (b) The station Maintenance Supervisor installing the
C flex line shall advise MCIMD of the following
C details by longline message:

C 1) Plane number.

C 2) Repair location in the plane by parts catalog
C reference.

C 3) TWA Stock number of hose assembly, if used,
C for repair.

C (c) MCIMD shall enter the item in AMPS and insure that
C the installation is rechecked at the next Check C
C operation. If flex hose is not replaced at check
C C, it must be set up for replacement at the next
C MCI base operation. Inspection will be
C responsible for sending the message to MCIMA for
C MCI base replacement.

C NOTE: All tube system repairs made with hose
C assemblies must be replaced not later than
C the next Base Operation.

C (6) Repair a damaged/worn section of hydraulic pressure
C system tubing in the No. 1 and/or No. 3 pylon upper cap
C area near pylon station 99.0 as directed by the
C following Paragraph 9 in this Chapter.

C (7) Optional Tubing Weld Repair

C (a) General

C 1) This section provides an optional weld type
C repair procedure for aircraft fluid tubing.

C 2) All weld repairs require Tungsten inert gas
C welding equipment, inert gas back-up on all welds
C and personnel proficient in their use.

CR 3) All optional weld repairs that have not
CR undergone a "proof test" are considered temporary

C and must be tested and subsequently replaced as
C directed in paragraphs B and C.

C (b) A system pressure test is to be made using the
C following procedure:

C 1) Install weld repaired tube on the aircraft and
C pressurize to the maximum system operating
C pressure.

C 2) Assure that no leakage or tube deformation
C exists in the installation.

CR (c) All optional weld repaired lines that must be
CR replaced should use the following guidelines:

C 1) The station maintenance personnel installing
C the line shall advise the MCI Maintenance
C Coordinator (MCIMD) of the following details by
C longline message.

C • Plane number.

C • Repair location in the plane by parts
C catalog reference.

C • Part number, Mfg. and TWA stock number, if
C applicable.

C 2) MCIMD shall insure a subsequent follow-up will
C then be initiated to remove the line at the
C earliest opportunity commensurate with the
C availability of the replacement tube. The
C replacement tube when available must be installed
C no later than the next Check "C" phase.

C (d) Repair Procedure

CR NOTE: Refer to GP&P, Chapt 9 for oxygen line
CR cleaning information after repair.

C 1) Wrap around or patch type of repairs shown in
C Figures 801 to 804 are preferred due to their
C ability to hold weld penetration to a minimum and
C not require tubing alignment fixtures.

C Penetration of any weld bead on the inside
C diameter of the tube shall not exceed the
C permissable tube defects or allowable damage and
C wear dimensions shown in Figure 601 shall not
C restrict the flow in the tube. All welding

C requires inert gas (argon or heilum) back up (See
C Figure 809).

C Repair Patch Material to be clamped in place and
C tack welded maintaining contact between doubler
C and tube.

C Repair Material - One gage thicker preferred.
C Alternate -Same thickness as material being
C repaired. Material composition as shown in Figure
C 810.

C 2) Flush tubing before and after welding with one
C of the following solvents. Methol Ethyl Keton,
C Aliphatic Naphtha, Tetrachlorethylene (degreaser),
C or equivalent to remove all oil and foreign
C materials. Tubing should then be dried before
C welding.

C The tubing and repair material in the weld area to
C be cleaned with a stainless steel wire brush or
C emery cloth to remove all oxides.

C 3) Repair sections shown in Figures 806 to 808
C require alignment fixtures to maintain the
C original tube configuration.

CR Refer to the tubing substitution chart in Table
CR 802 for the required material and thickness.

C All end connections must be deburred, cleaned, and
C the oxide removed before welding.

C The butt welded section shown in Figure 806
C requires 100% weld penetration.

C CAUTION: DO NOT EXCEED THE PENETRATION DEPTH FOR
C DENTS SHOWN IN TABLE II (Ref. Section).

C 2. Repair Tooling

C A. Harrison Portable Hand Swaging Tool Kit, Model 5175 (1/4"
C through 1/2" tube capacity):

C (1) This tool kit shall be used for fastening the BAC S13BD
C contoured flareless tube fitting sleeve to 1/4 OD
C through 1/2 OD 21-6-9 "thin-wall" CRES and 6061-T6
C aluminum alloy tubing sy swaging the tube wall into
C internal grooves on the Sleeve ID.

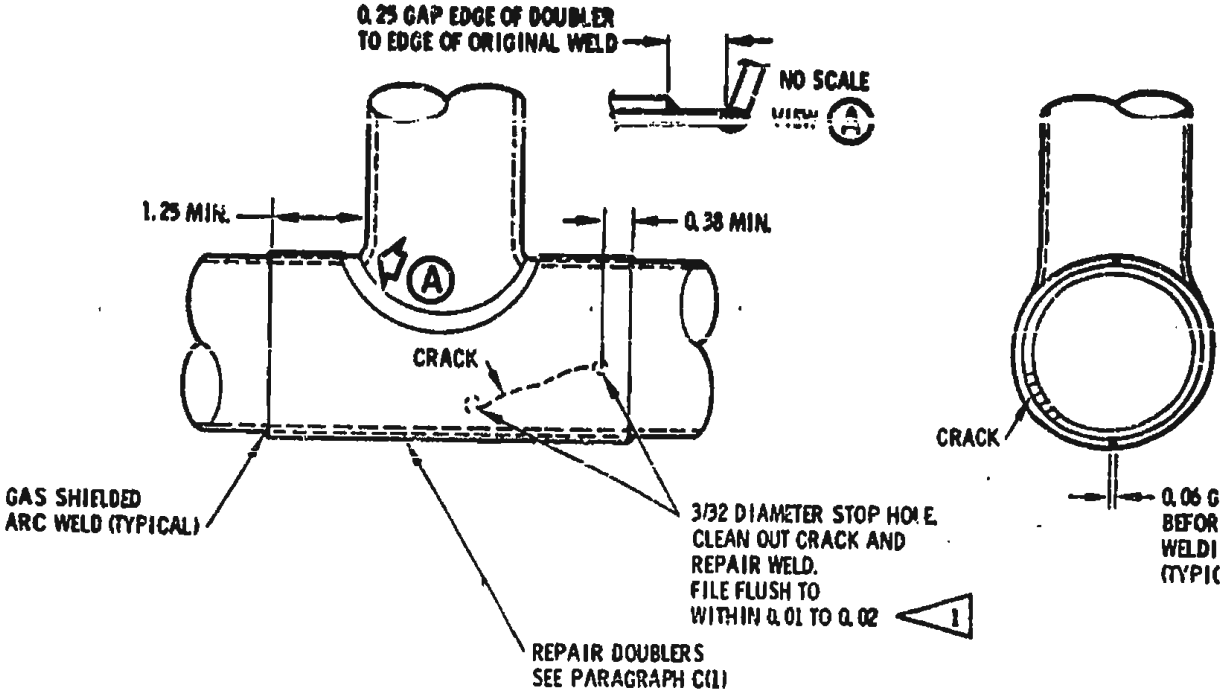


FIGURE 801

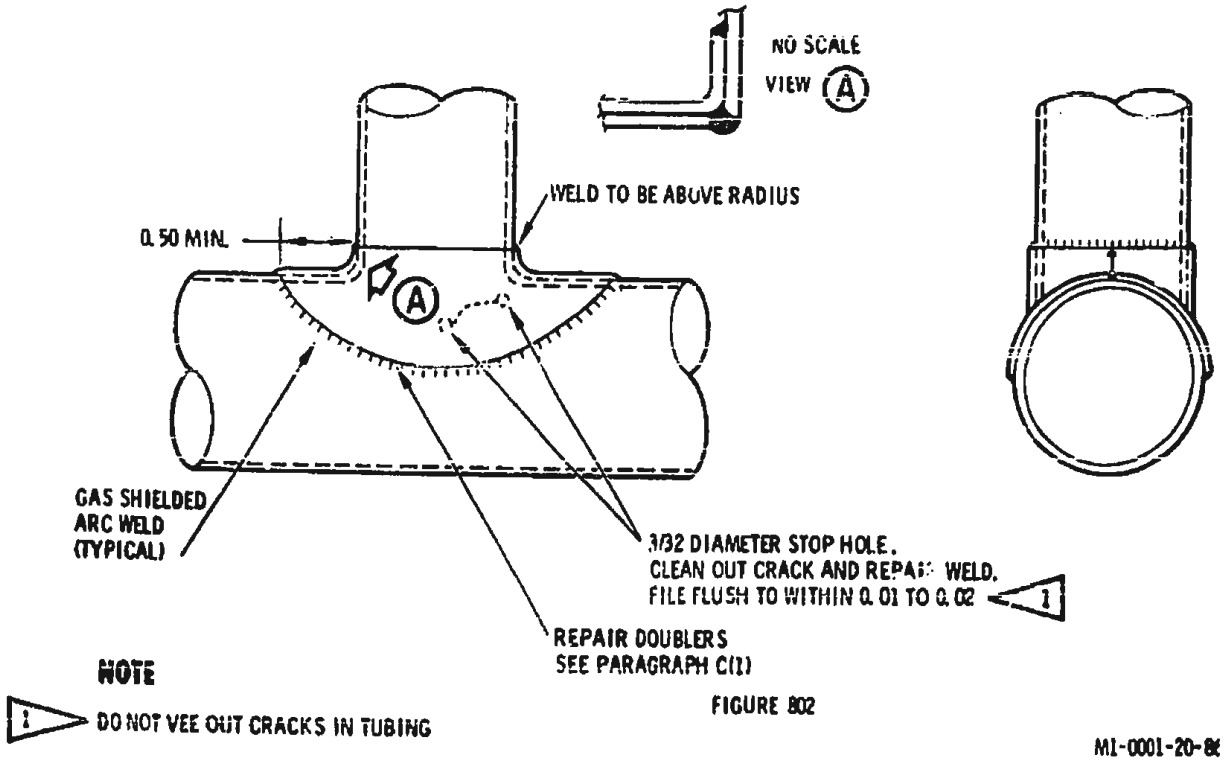


FIGURE 802

NOTE

1 DO NOT VEE OUT CRACKS IN TUBING

M1-0001-20-8

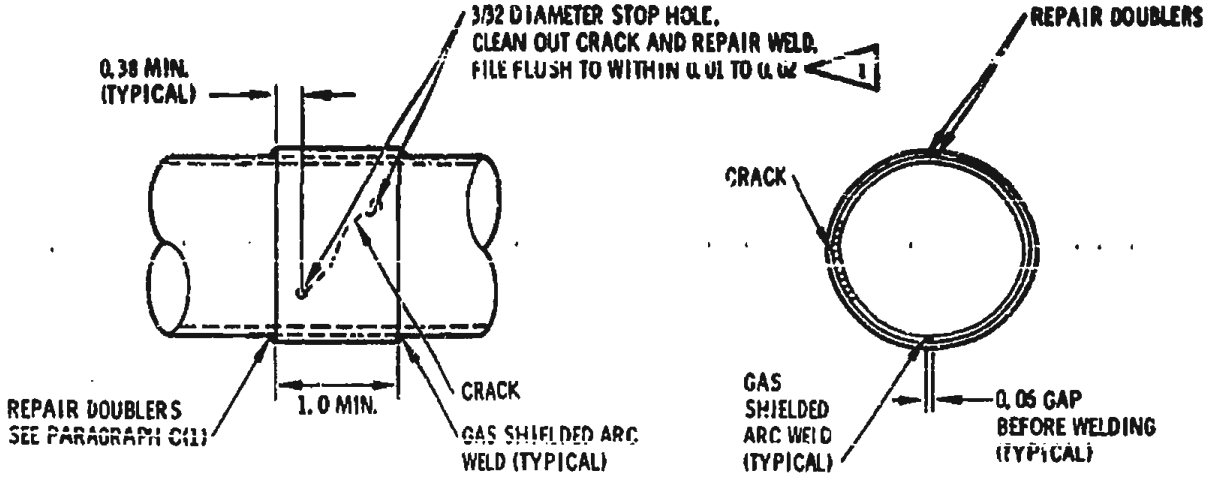


FIGURE 803

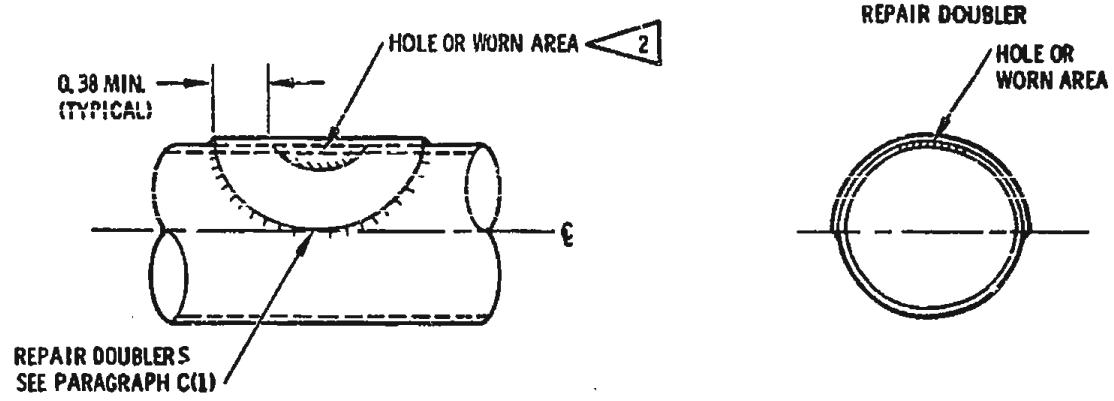
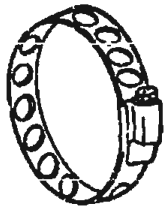


FIGURE 804



STAINLESS STEEL HOSE CLAMP WITH HOLES TO ALLOW TACK WELDING. AFTER TACK WELDING, REMOVE CLAMP AND COMPLETE WELDING

NOTE

1. DO NOT VEE OUT CRACKS ON TUBING
2. WORN OR HOLE AREA NOT TO BE WELDED IF LARGER THAN 0.050 IN DIAMETER. IF AREA IS WORN THROUGH, REMOVE THIN SECTION AND DEBURR

FIGURE 805

M1-0001-20-869

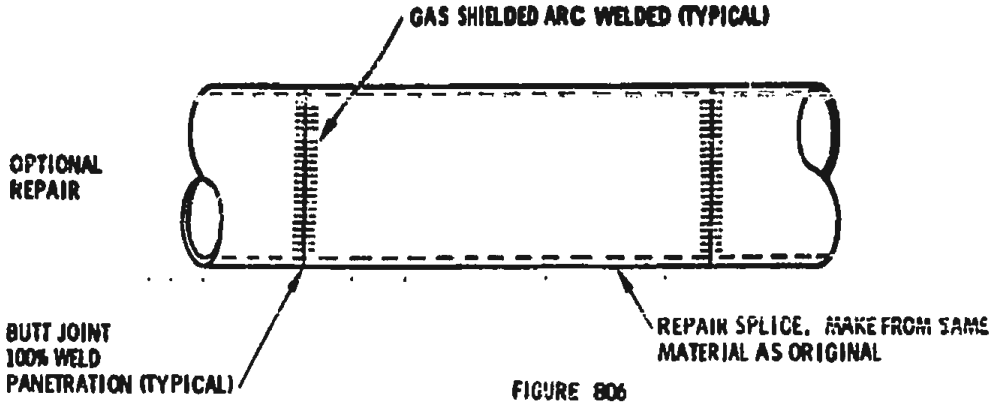

GAS SHIELDED ARC WELDED (TYPICAL)
OPTIONAL REPAIR
BUTT JOINT 100% WELD PENETRATION (TYPICAL)
REPAIR SPLICE. MAKE FROM SAME MATERIAL AS ORIGINAL

FIGURE 806

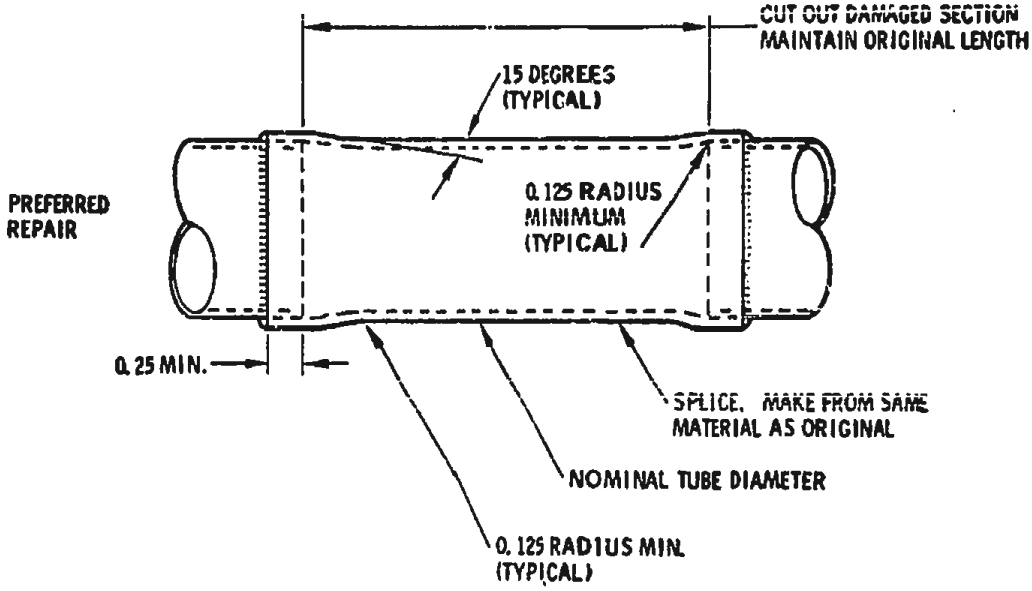

CUT OUT DAMAGED SECTION MAINTAIN ORIGINAL LENGTH
15 DEGREES (TYPICAL)
PREFERRED REPAIR
0.125 RADIUS MINIMUM (TYPICAL)
0.25 MIN.
SPLICE. MAKE FROM SAME MATERIAL AS ORIGINAL
NOMINAL TUBE DIAMETER
0.125 RADIUS MIN. (TYPICAL)

FIGURE 807

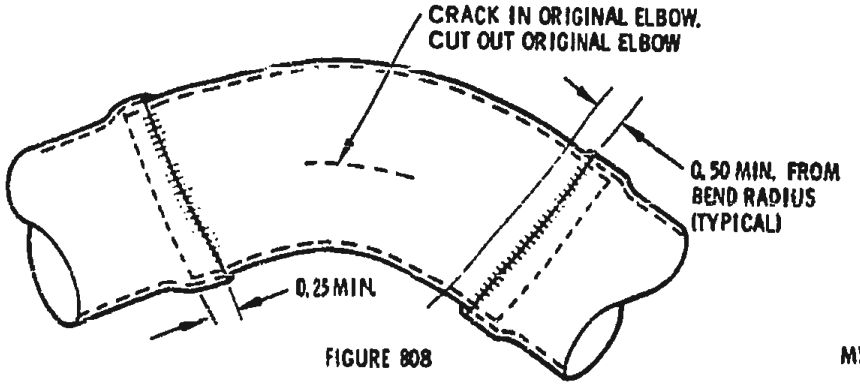


FIGURE 808

M1-0001-20-870

PART DIAMETER IN INCHES	GAS FLOW			
	10 CFH	20 CFH	30 CFH	40 CFH
1	15 SECONDS			
1-1/2	30 SECONDS	15 SECONDS	12 SECONDS	10 SECONDS
2	1 MINUTE	30 SECONDS	24 SECONDS	15 SECONDS
2-1/2	1-1/2 MINUTES	45 SECONDS	30 SECONDS	25 SECONDS
3	2-1/2 MINUTES	1-1/4 MINUTES	45 SECONDS	35 SECONDS
3-1/2	3-1/4 MINUTES	1-1/2 MINUTES	1 MINUTES	45 SECONDS

PURGE TIME REQUIREMENTS PER FOOT OF LENGTH FOR TUBULAR PARTS

(1) SEAL OPENING AT END OF PART WHERE GAS IS FED IN.

(2) PROVIDE OPENING AT OPPOSITE END OF FUEL LINE TO EXHAUST GAS.

(3) PURGE INSIDE OF TUBE WITH ARGON GAS EQUAL TO APPROXIMATELY EIGHT TIMES THE VOLUME OF AIR BEING DISPLACED PRIOR TO START OF WELDING PROCEDURES.

(4) REDUCE GAS FLOW TO FIVE TO 10 CUBIC FEET PER HOUR (CFH) AND CONTINUE PURGING DURING WELDING PROCESS.

(5) TUBES BELOW ONE INCH REQUIRE PURGE TIMES AND FLOW EQUAL TO A ONE INCH DIAMETER TUBE.

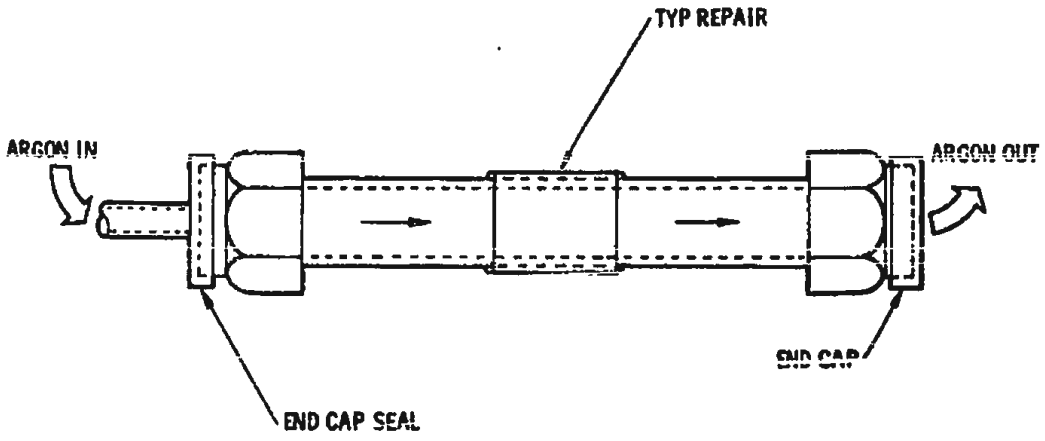


FIGURE 809

M1-0001-20-871

TUBING	REPAIR MATERIAL	WELDING ROD
21-6-9	21-6-9 ALT 304 1/8H ALT 304 SS	21-6-9 ALT 347 SS
304 1/8H	304 1/8H SS ALT 304 SS	347 SS 347 SS
6061-T6	6061-T6	43 S (4043 ALUM)
5052-0	6061-T6 5052-0	43 S (4043 ALUM) 43 S (4043 ALUM)

3AL - 2.5V TITANIUM WELD REPAIR NOT AUTHORIZED

TUBING REPAIR MATERIAL AND WELDING ROD
FIGURE 810

M1-0001-20-872

C (2) The kit consists of the necessary tooling for accomplishing the swaging operation and an internal depth measuring gauge for checking the swaging operation. The entire kit is packaged in a portable container.

C (3) An operating instructional manual is included in the kit assembly. Refer to Illustrated Tool and Equipment Manual Chapter 20-11-03 for additional details.

C B. Harrison Portable Hand Swaging Tool Kit, Model 5720 (5/8" through 1-1/2" tube capactiy):

C (1) This tool kit consists of the same general type of parts and shall be used for a similar type swaging operation except it shall be used for swaging the BAC S13BD sleeve to 5/8 OD through 1-1/2 OD 21-6-9 CRES and 6061-T6 aluminum alloy tubing.

C (2) An operating instructional manual is included in the kit assembly. Refer to Illustrated Tool and Equipment Manual, Chapter 20-11-04 for additional details.

C C. Hand Presetting Die Kit - GEN-2675

C (1) This kit consists of the appropriately-sized internal mandrels for presetting the standard MS-flareless tube fitting sleeve onto 21-6-9 "thin-wall" CRES and 6061-T6 aluminum alloy tubing. Use the of the kit will prevent partial tube wall collapse during the presetting operation.

C (2) Refer to Illustrated Tool and Equipment Manual, Chapter 20-11-01 for kit details.

C D. DYNATUBE Male Fitting Resurfacing Tool Kit - GEN 3093-1

C (1) This kit may be used to burnish the sealing surface of a DYNATUBE male fitting when this surface becomes marred or scratched. The kit consists of a body, a lock sleeve, and a cup surfaced with an emery disk. The tool has a knurled handle for hand rotating the emery disk against the surface of the fitting. A lube repair kit contains lubricant, applicators, and solvents for applying in a new coat of solid film lubricant.

C (2) Refer to Illustrated Tool and Equipment Manual, Chapter 20-01-02 for additional details.

C E. DYNATUBE Coupling Swage Tool Kit Assembly - Resistoflex Kit C Part Number R27500L

C (1) The Kit Assembly must be used to swage the male and
C female halves of the Dynatube coupling assembly onto
C 21-6-9 CRES and 6061-T6 Aluminum Alloy tube ends.
CR Additional Dynatube swaging tools may be used to
CR assemble fittings on the 304 1/8 hard stainless steel
CR (CRES) tubing listed in Table 802.

CR NOTE: (1) Tubing inside diameter after swaging must
CR conform to dimension listed on the individual
CR tool I.D. band.

CR (2) Swaging the Dynatube coupling halves on to
CR 304 annealed stainless steel (CRES) tube
CR material is not authorized.

C (2) The Kit Assembly consists of the necessary parts sized
C as required for use on the specific L1011 standard
C tubing sizes. The parts are stored in three portable
C luggage-type containers. The parts include a die set
C for the male and female coupling halves; an expander; a
C holding collar; a dial-reading ID gauge (for measuring
C the depth of swage); and a Vee-anvil micrometer.

C (3) Refer to Illustrated Tool and Equipment Manual, Chapter
C 20-01-06 for operational instructions and other
C pertinent details.

C F. Flareless Fitting Hand Presetting Die Kit - Boeing Tool ST
C 879

C (1) The ST879 kit consists of a presetting die, depth plug
C and set screw for hand presetting the BAC 513AP
C flareless sleeve onto Type 304 CRES tubing with .034
C wall thickness or larger and -3 through -12 tube OD
C size.

C CAUTION: DO NOT USE THIS TOOL FOR PRESETTING SLEEVES ON
C 21-6-9 or 6061-T6 TUBING.

C (2) Refer to Illustrated Tool and Equipment Manual, Chapter
C 20-01-05 for additional details.

C 3. Referenced Procedures

C 29-11-00 Hydraulic Power System - Maintenance Practices

C 35-21-00 Oxygen System - Maintenance Practices

C 4. Repair Procedures and Instructions

C WARNING: IF HYDRAULIC TUBE IS TO BE REPAIRED, VERIFY THAT
C APPLICABLE HYDRAULIC SYSTEM IS SHUT OFF (REF.
C 29-11-00). TAG FLIGHT ENGINEER/SECOND OFFICERS
C HYDRAULIC SYSTEM PANEL, ZONE 215, and HYDRAULIC
C SERVICE PANEL, ZONE 147.

C IF OXYGEN TUBE IS TO BE REPAIRED, VERIFY THAT
C APPLICABLE OXYGEN SYSTEM IS SHUT OFF AND THAT LINE IS
C DEPRESSURIZED (REF. 35-21-00). TAG PILOTS OVERHEAD
C CIRCUIT BREAKER PANEL CB1, ZONE 210. OBSERVE SAFETY
C PRECAUTIONS APPLICABLE TO OXYGEN SYSTEM: KEEP ALL
C OILS, GREASES, RAGS AND COMBUSTIBLES AWAY FROM OXYGEN
C SYSTEM COMPONENTS.

C A. DYNATUBE Male Fitting Rework (Refer to Fig. 802 for specific
C fitting end identification)

C (1) Sealing Surface Refinishing.

C (a) If leakage from a DYNATUBE coupling assembly
C cannot be stopped by retightening, disassemble and
C examine the mating surfaces of the fittings for
C evidence of minor scratches. A scratch or other
C minor surface damage on the dry film lubricant
C surface of the male fitting may be repaired by
C refinishing or resurfacing as described by the
C procedure in Section 20-01-02 of the TWA
C Illustrated Tool and Equipment Manual, using the
C GEN 3093-1 Tool Kit.

C (b) An alternate procedure for eliminating leaks
C caused by a scratched or deformed mating surface
C on either or both halves of a DYNATUBE FITTING
C ASSEMBLY will be the installation of a DYNARING
C sealing washer in the assembly. Once installed,
C the sealing washer shall be considered as a
C permanent repair and maintained as such until the
C complete DYNATUBE fitting assembly is replaced.
C The washer may be reused as long as it effectively
C eliminates leakage from the assembly.

C 1) Installing DYNARING sealing washer.

C a) Select washer size designated for Tube OD.
C (Ref. Table 801).

C b) Position the washer against beveled
C surface of fitting half (Ref. Fig. 801).

C c) Hand tighten the nut onto the opposite C fitting.

C d) Torque the DYNATUBE assembly together per C standard procedure.

C (2) Fitting Replacement (Refer to Plan IV on Fig. 803 for C schematic details).

C (a) If the male fitting is part of a removable part, C replace the complete part with:

C 1) A similar part, or

C 2) An MS21902 Union or MS21916 Reducer and the C appropriate size NAS 1612 O-ring.

C NOTE: If 1) replacement is selected, the mating C part of the tubing system must be modified C to a MS-flareless type nut/sleeve assembly. C Install the MS-flareless nut/sleeve C assembly as directed by Paragraph 4.C.

C (b) The male half of the coupling may be replaced with C an identical part (Resistoflex P/N MR 44100) by C cutting off the defective coupling and installing C a splice tube section as described in Paragraph C 4.D.

C CAUTION: ASSURE THAT THE REQUIRED RESISTOFLEX SWAGING TOOL KIT C IS AVAILABLE BEFORE CONSIDERING THIS REPAIR C INSTALLATION.

C B. DYNATUBE Nut/Shoulder (Female) Fitting Rework

C NOTE: Refer to Plan I, II or III of Figure 803 for C schematic details. Figures 804 to 808 detail repair C sections and tube connector assemblies.

C (1) If the nut/shoulder fitting end is defective and must C be replaced (but the male end is satisfactory), the C coupling assembly will be converted to a MS-flareless C type by the following procedure.

C (a) Cut off the nut/shoulder fitting end from the tube C section.

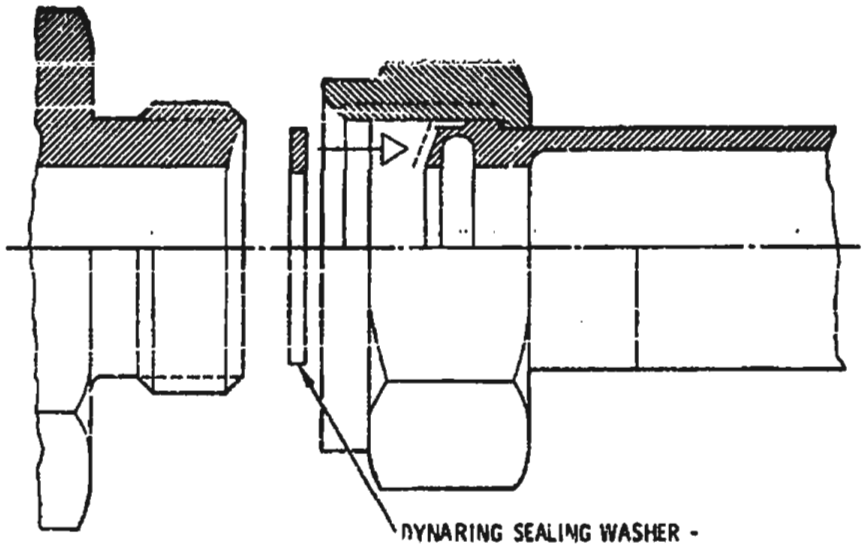
C (b) Install one of the following listed adapter C connector assemblies (type of adapter selected to C fit the tube configuration) of the appropriate C size to the MALE END of the coupling assembly.

DASH NO.	TUBE O.D.	A DIA	B DIA	WASHER PART NUMBER
-4	1/4	0.198	0.372	AP2641N04
-5	5/16	0.265	0.435	AP2641N05
-6	3/8	0.321	0.485	AP2641N06
-8	1/2	0.422	0.642	AP2641N08
-10	5/8	0.542	0.760	AP2641N10
-12	3/4	0.694	0.904	AP2641N12
-16	1	0.907	1.143	AP2641N16
-20	1-1/4	1.150	1.408	AP2641N20

M1-0000-20-851

C C Dynaring Washer Selection Chart
Table 801

R R 0028 EFFECTIVITY: ALL



M1-0000-20-850

C
C

Dynaring Washer Installation
Figure 801

R
R
002B

EFFECTIVITY: ALL

C C C

C C C installation run being repaired or that presented in the recommended or alternate material lists of Table 802.

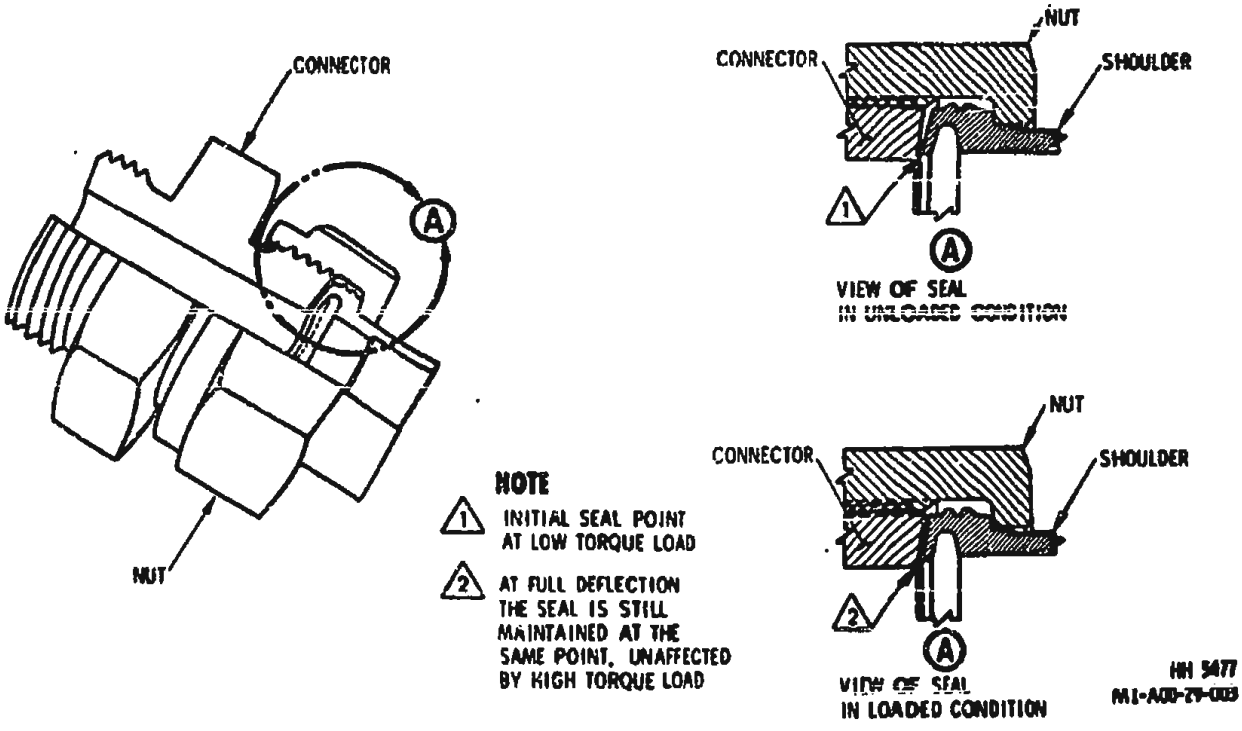
C C (2) Cut, deburr and bend tubing to proper length and shape. Observe the following:

C C (a) Tube end shall be cut 90° ± 1/2° to the tube centerline.

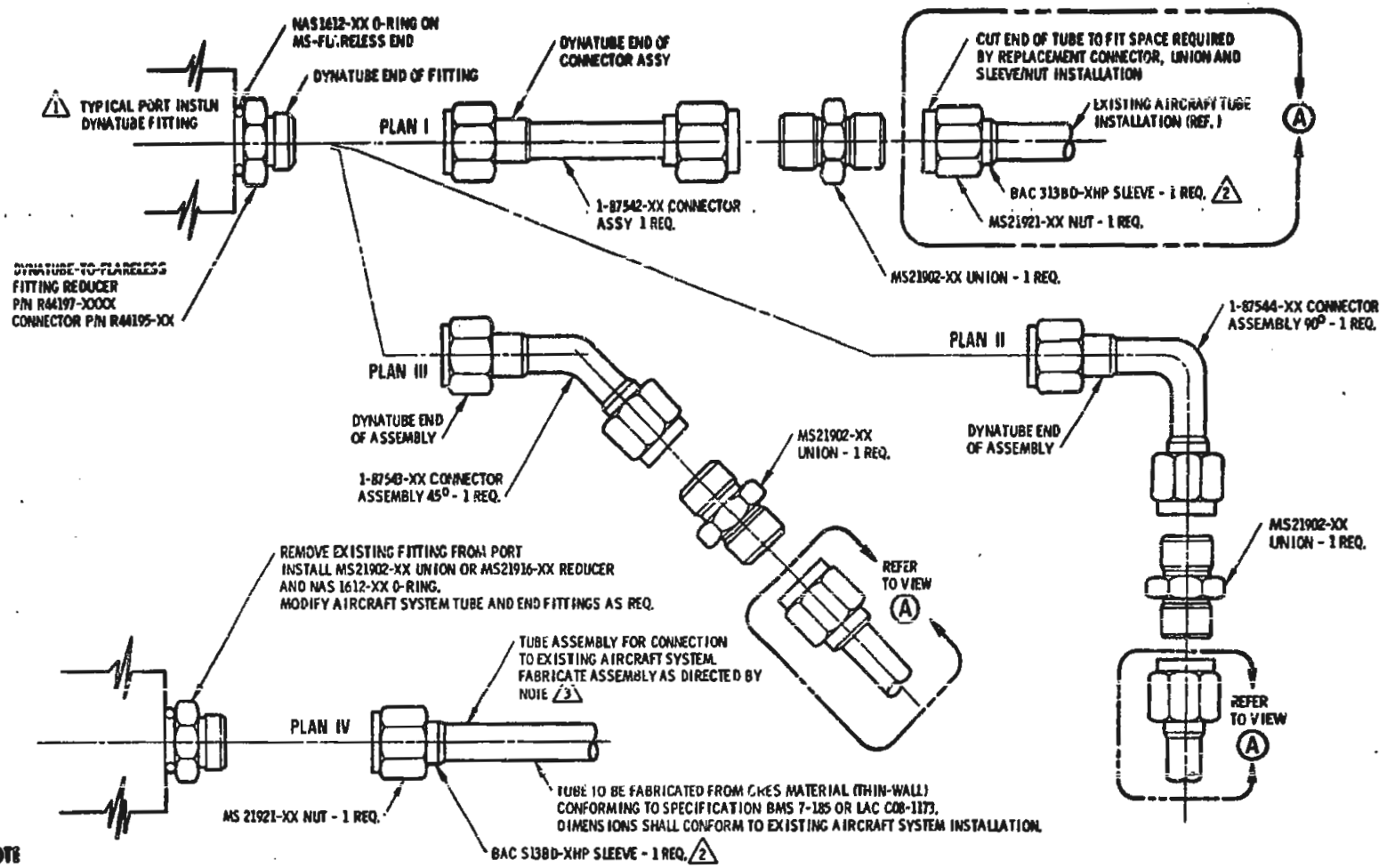
C C (b) All burrs shall be removed from inside and outside of tube ends.

C C C C C C C C C (c) The tube end assembled in the fitting cavity shall be round and straight for a length as long as possible. It is desirable that the straight run be equal to twice the length of the sleeve nut. If the specific installation does not permit the recommended straight run, the assembly shall be fabricated so that the tail end of the sleeve does not extend into the bend radii.

C C C NOTE: Refer to Figures 817 and/or 818 for specific minimum dimensions to guide the sleeve installation.



C C Dynatube Coupling Assembly Detail
Figure 802


NAS1612-XX O-RING ON MS-FLARELESS END
DYNATUBE END OF FITTING
DYNATUBE END OF CONNECTOR ASSY
CUT END OF TUBE TO FIT SPACE REQUIRED BY REPLACEMENT CONNECTOR, UNION AND SLEEVE/NUT INSTALLATION
EXISTING AIRCRAFT TUBE INSTALLATION (REF.)
TYPICAL PORT INSTLN DYNATUBE FITTING
PLAN I
1-87542-XX CONNECTOR ASSY 1 REQ.
BAC 313BD-XHP SLEEVE - 1 REQ. 2
MS21921-XX NUT - 1 REQ.
MS21902-XX UNION - 1 REQ.
DYNATUBE-TO-FLARELESS FITTING REDUCER P/N R44197-XXXX CONNECTOR P/N R44195-XX
PLAN II
1-87544-XX CONNECTOR ASSEMBLY 90° - 1 REQ.
PLAN III
DYNATUBE END OF ASSEMBLY
MS21902-XX UNION - 1 REQ.
1-87543-XX CONNECTOR ASSEMBLY 45° - 1 REQ.
DYNATUBE END OF ASSEMBLY
MS21902-XX UNION - 1 REQ.
REFER TO VIEW A
REMOVE EXISTING FITTING FROM PORT INSTALL MS21902-XX UNION OR MS21916-XX REDUCER AND NAS 1612-XX O-RING. MODIFY AIRCRAFT SYSTEM TUBE AND END FITTINGS AS REQ.
TUBE ASSEMBLY FOR CONNECTION TO EXISTING AIRCRAFT SYSTEM. FABRICATE ASSEMBLY AS DIRECTED BY NOTE 3
PLAN IV
REFER TO VIEW A
TUBE TO BE FABRICATED FROM CRES MATERIAL (THIN-WALL) CONFORMING TO SPECIFICATION BMS 7-185 OR LAC C08-1173. DIMENSIONS SHALL CONFORM TO EXISTING AIRCRAFT SYSTEM INSTALLATION.
MS 21921-XX NUT - 1 REQ.
BAC S13BD-XHP SLEEVE - 1 REQ. 2

NOTE

1. "DYNATUBE" REFERS TO A PROPRIETARY TUBE FITTING DESIGN MANUFACTURED BY RESISTOFLEX CORPORATION, ROSELAND, NEW JERSEY 07068.
2. APPROVED ALTERNATE: BAC S13AP-XHP SLEEVE.
3. FABRICATE THE TUBE SECTION OF PROPER PARTS AND SUFFICIENT LENGTH TO CONNECT INTO THE AIRCRAFT SYSTEM AT THE NEXT PRODUCTION FITTING INSTALLATION. HIGH PRESSURE HOSE ASSEMBLY MAY BE SUBSTITUTED FOR THE TUBE ASSEMBLY. IF AN ADDITIONAL SPLICE INSTALLATION IS REQUIRED TO JOIN THE TUBE SECTION INTO THE EXISTING AIRCRAFT SYSTEM, USE APPLICABLE PART OF PROCEDURE SHOWN ON FIGURE 802 (SHEET 3).

IF LEAKAGE IS FOUND IN THIS TUBE FITTING ASSEMBLY, FIRST DETERMINE WHETHER FITTING OR AIRCRAFT TUBE SYSTEM END IS FAULTY. IF FITTING IS DEFECTIVE -

1. REPLACE WITH IDENTICAL DYNATUBE FITTING PART OR
2. REPLACE FITTING WITH STANDARD MS FLARELESS MS 21902-XX UNION OR MS 21916-XX REDUCER AND MAS 1612-XX O-RING AND MODIFY AIRCRAFT TUBE SYSTEM AS SHOWN IN PLAN IV

IF SYSTEM TUBE END IS FAULTY, CORRECT THE PROBLEM PER PLAN I, II, III, OR IV AS APPLICABLE.

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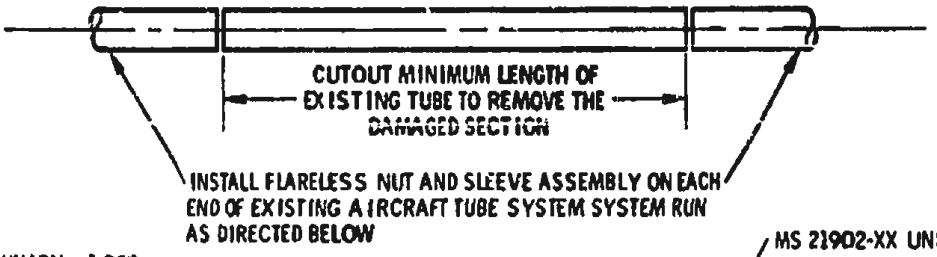
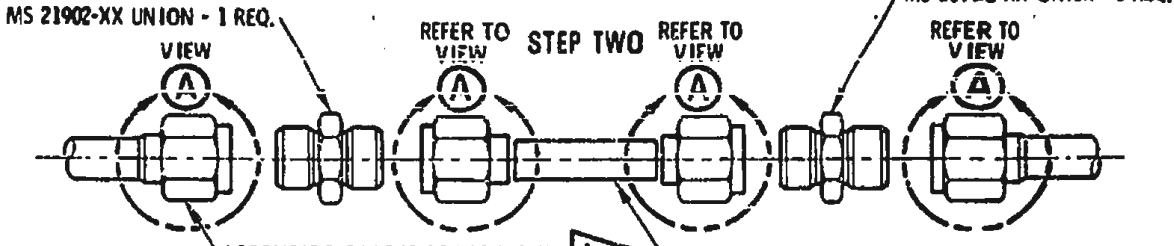
C C Repair Procedures - Dynatube Fittings Installation
Figure 803

R EFFECTIVITY: ALL
R
0028

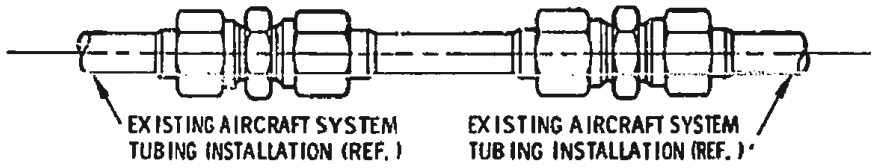
STEP ONE


CUTOUT MINIMUM LENGTH OF EXISTING TUBE TO REMOVE THE DAMAGED SECTION
INSTALL FLARELESS NUT AND SLEEVE ASSEMBLY ON EACH END OF EXISTING AIRCRAFT TUBE SYSTEM SYSTEM RUN AS DIRECTED BELOW

STEP TWO


MS 21902-XX UNION - 1 REQ.
REFER TO VIEW A
REFER TO VIEW A
REFER TO VIEW A
MS 21902-XX UNION - 1 REQ.
ASSEMBLE THE PARTS AS LISTED IN 1 TO EACH END OF EXISTING AIRCRAFT SYSTEM TUBING AND THE TUBE REPAIR SECTION PER STANDARD PROCEDURES IN CHAPTER 20 OF THE SPECIFIC AIRCRAFT MAINTENANCE MANUAL
TUBE REPAIR SECTION - 1 REQ. 2
MATERIAL: STEEL TUBING
LENGTH: TO FIT SPECIFIC APPLICATION
FABRICATE TUBE REPAIR SECTION SUB ASSEMBLY FROM NOTED PARTS
ALTERNATE: PROCURE HIGH-PRESSURE FLEXIBLE HOSE ASSEMBLY TO FIT O. D. AND LENGTH REQUIREMENTS IF REPAIR AREA MORE ADAPTABLE TO HOSE ASSEMBLY THAN TO STEEL TUBE SECTION

STEP THREE



TUBE REPAIR SECTION INSTALLATION

1. ASSEMBLE UNIONS ON EACH END OF TUBE REPAIR SECTION.
2. INSTALL TUBE REPAIR SECTION AND UNIONS ASSEMBLY (OR HIGH-PRESSURE HOSE ASSEMBLY) INTO EXISTING AIRCRAFT TUBING SYSTEM.
3. TIGHTEN ALL NUTS PER STANDARD FLARELESS FITTING ASSEMBLY PROCEDURE IN CHAPTER 20 OF SPECIFIC AIRCRAFT MODEL MAINTENANCE MANUAL.

NOTE

2 CORROSION-RESISTANT STEEL THIN-WALL TUBING PER BOEING SPEC. BMS 7-185 OR LOCKHEED SPEC. C08-1173. (O. D. AND WALL THK. STANDARD SIZES FOR THIN-WALL SPEC. TUBING).

1 PARTS REQUIRED FOR ASSEMBLY ON EACH TUBE END:
1 EACH BAC S13BD-(X)HP SLEEVE (SWAGED TYPE)
OR
BAC S13AP-X SLEEVE (STD. MS-FLARELESS TYPE)
1 EACH MS 21921-XX NUT

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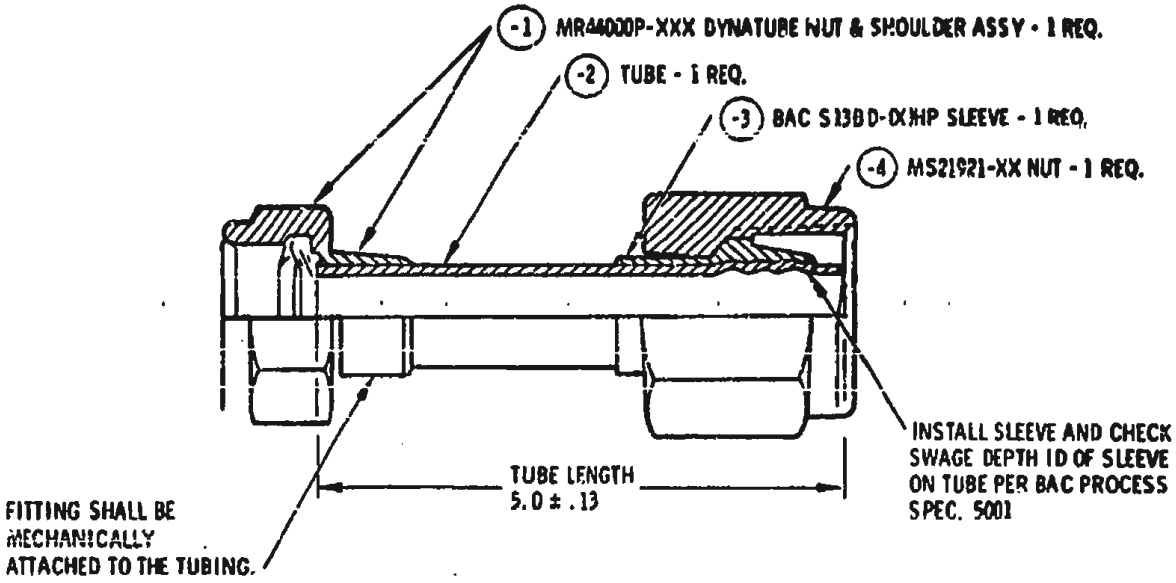
C
C

Tube Repair Procedure
Figure 804


(-1) MR44000P-XXX DYNATUBE NUT & SHOULDER ASSY - 1 REQ.
(-2) TUBE - 1 REQ.
(-3) BAC S13BD-(X)HP SLEEVE - 1 REQ.
(-4) MS21921-XX NUT - 1 REQ.
INSTALL SLEEVE AND CHECK SWAGE DEPTH ID OF SLEEVE ON TUBE PER BAC PROCESS SPEC. 5001
TUBE LENGTH 5.0 ± .13
FITTING SHALL BE MECHANICALLY ATTACHED TO THE TUBING.

ASSEMBLY DASH NO.	(-1) NUT & SHOULDER ASSY. PART NUMBER △1	(-2) TUBE SIZE & MAT'L O.D. X WALL THK.	MAT'L	(-3) SLEEVE PART NUMBER	(-4) NUT PART NUMBER
-03	MR44000P-03	△3	△3	BACS13BD-3HP	MS21921-3J
-04	-04	1/4 x .016	△2	-4HP	-4J
-05	-05	5/16 x .020		-5HP	-5J
-06	-06	3/8 x .020		-6HP	-6J
-08	-08	1/2 x .026		-8HP	-8J
-10	-10	5/8 x .033		-10HP	-10J
-12	-12	3/4 x .039		-12HP	-12J
-16	-16	1.0 x .052		-16HP	-16J
-20	-20	1-1/4 x .065	△2	-20HP	-20J

NOTE

△1 MANUFACTURER: RESISTOFLEX CORP., ROSELAND, N. J. 07068

△2 CORROSION-RESISTANT STEEL TUBING PER BOEING SPEC. BMS 7-185 OR LOCKHEED SPEC. CQ2-1173.

△3 TO BE DETERMINED

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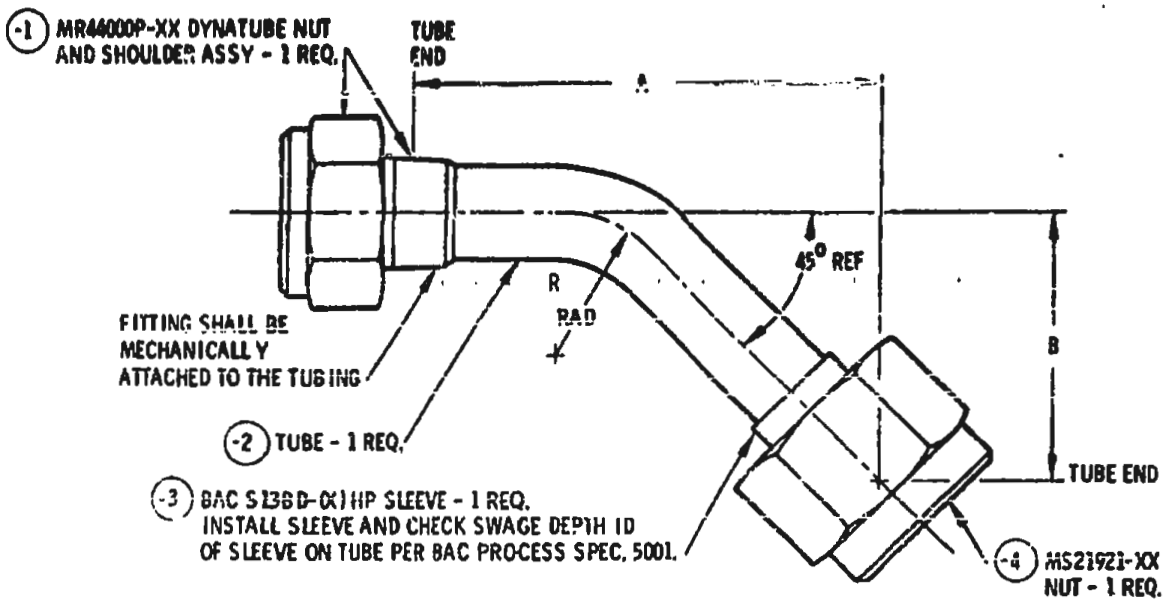
C C Tube Connector Assembly - Dynatube to Flairless
Figure 805

R R 002B EFFECTIVITY: ALL


-1 MR44000P-XX DYNATUBE NUT AND SHOULDER ASSY - 1 REQ.
TUBE END
A
45° REF
R RAD
B
FITTING SHALL BE MECHANICALLY ATTACHED TO THE TUBING
-2 TUBE - 1 REQ.
-3 BAC S13BD-0(1)HP SLEEVE - 1 REQ. INSTALL SLEEVE AND CHECK SWAGE DEPTH ID OF SLEEVE ON TUBE PER BAC PROCESS SPEC. 5001.
TUBE END
-4 MS21921-XX NUT - 1 REQ.

ASSEMBLY DASH NO.	-1 DYNATUBE NUT AND SHOULDER ASSY. PART NUMBER (1)	-2 TUBE O. D. AND WALL THK. (2)	-3 SLEEVE PART NUMBER	-4 NUT PART NUMBER	A ± 0.13	B ±.13	R ±.20
-04	MR44000P-04	1/4 x .016	BAC S13BD-4HP	MS21921-4J	5.344	3.719	.75
-05	-05	5/16 x .020	-5HP	-5J	5.250	3.719	.95
-06	-06	3/8 x .020	-6HP	-6J	5.234	3.750	1.13
-08	-08	1/2 x .026	-8HP	-8J	5.344	3.375	1.50
-10	-10	5/8 x .033	-10HP	-10J	5.313	3.438	1.88
-12	-12	3/4 x .039	-12HP	-12J	5.375	3.250	2.25
-16	-16	1.0 x .052	-16HP	-16J	5.219	3.000	3.00
-20	-20	1-1/4 x .065	-20HP	-20J	5.157	3.125	3.75

NOTE

(1) MANUFACTURER: RESISTOFLEX CORP., ROSELAND, NEW JERSEY 07068.

(2) CORROSION-RESISTANT STEEL TUBING PER BOEING SPEC. BMS 7-185 OR LOCKHEED SPEC. C08-1173.

(3) REF: TWA DRAWING 1-87543

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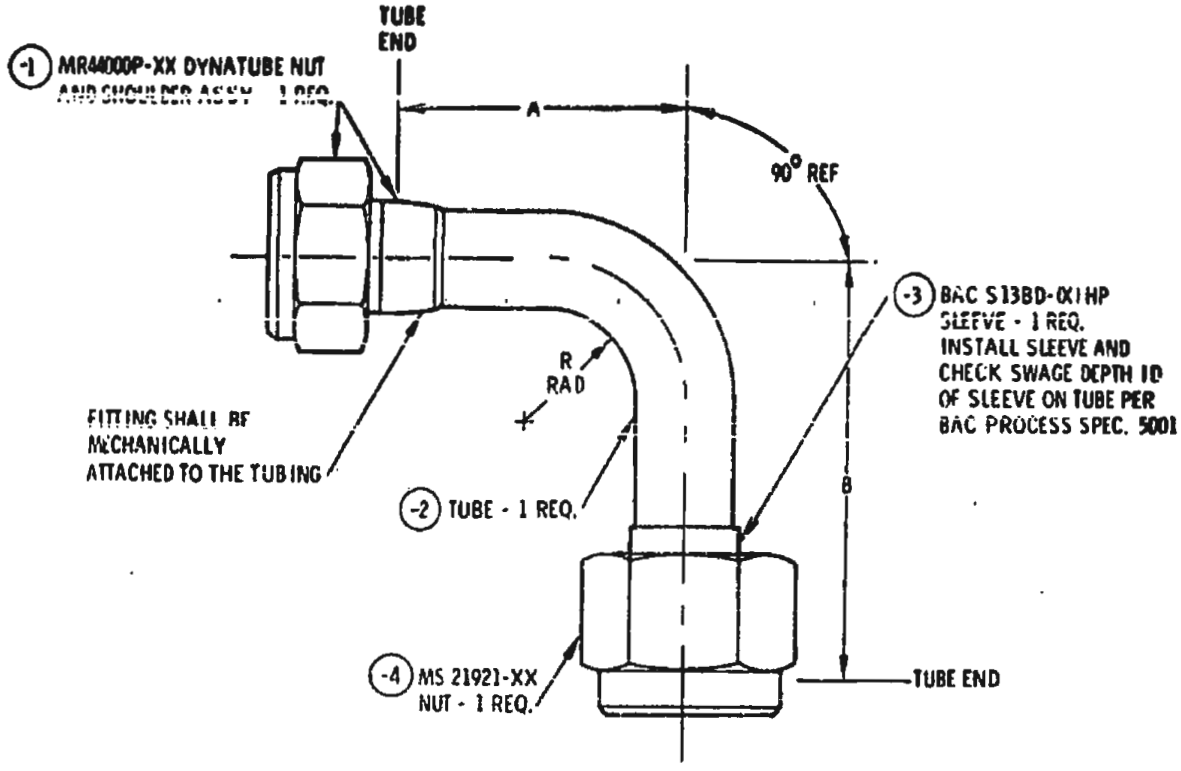
C Tube Connector Assembly - 45° Dynatube to Flairless
C Figure 806


TUBE END
(-1) MR44000P-XX DYNATUBE NUT AND SHOULDER ASSY - 1 REQ.
A
90° REF
(-3) BAC S13BD-0X1HP SLEEVE - 1 REQ. INSTALL SLEEVE AND CHECK SWAGE DEPTH ID OF SLEEVE ON TUBE PER BAC PROCESS SPEC. 5001
R RAD
FITTING SHALL BE MECHANICALLY ATTACHED TO THE TUBING
(-2) TUBE - 1 REQ.
B
(-4) MS 21921-XX NUT - 1 REQ.
TUBE END

ASSEMBLY DASH NO.	(-1) DYNATUBE NUT AND SHOULDER ASSY. PART NUMBER △1	(-2) TUBE O.D. AND WALL THK. △2	(-3) SLEEVE PART NUMBER	(-4) NUT PART NUMBER	A ± 0.13	B ± .13	R ±.20
-04	MR44000P-04	1/4 x .016	BAC S13BD-4HP	MS21921-4J	1.750	5.215	.75
-05	-05	5/16 x .020	-5HP	-5J	1.875	5.205	.95
-06	-06	3/8 x .020	-6HP	-6J	1.875	5.227	1.13
-08	-08	1/2 x .026	-8HP	-8J	2.250	4.476	1.50
-10	-10	5/8 x .033	-10HP	-10J	2.250	4.773	1.88
-12	-12	3/4 x .039	-12HP	-12J	2.844	4.450	2.25
-16	-16	1.0 x .052	-16HP	-16J	3.188	4.063	3.00
-20	-20	1-1/4 x .065	-20HP	-20J	2.906	4.188	3.75

NOTE

△1 MANUFACTURER: RESISTOFLEX CORP., ROSELAND, NEW JERSEY 07068.

△2 CORROSION-RESISTANT STEEL TUBING PER BOEING SPEC. BMS 7-105 OR LOCKHEED SPEC. C08-1173.

△3 REF: TWA DRAWING 1-87544

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C C Tube Connector Assembly - 90° Dynatube to Flairless
Figure 807

R R 002B EFFECTIVITY: ALL

C (3) Finish tubing end as shown in Figure 808.

C (4) Preset a flareless-type fitting sleeve nut onto each C end of the tube section.

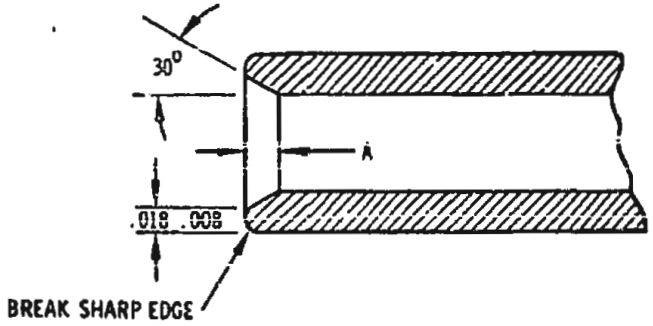
C NOTE: Observe the following (a) and (b) requirements C regarding selection of the correct type C presetting tool and sleeve combination for the C specific tube material.

C (a) 21-6-9 CRES and 6061-T6 Aluminum "Thin-wall" C Tubing.

C 1) Use the GEN 2675 Hand Presetting Kit (with C internal mandrel) for presetting BAC S13AP C (standard MS-flareless) sleeve on ALL OD/wall C thickness "thin-wall" tubing.

C a) Refer to Paragraph (c) following for C presetting procedure details.

C 2) Use Harrison Model 5175 or 5720 Portable Hand C Swaging Kit for presetting BAC S13BD contoured C flareless sleeve on all "thin-wall" tubing.



TUBE SIZE	-4	-5	-6	-8	-10	-12	-16	-20
DIM. A (INCH)	.010 .035	.010 .035	.010 .035	.015 .040	.020 .050	.020 .050	.030 .060	.030 .065

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C Tube End Chamfer
C Figure 808

R EFFECTIVITY: ALL
R
002B

C a) Refer to Paragraph (d) following for
C presetting procedure details.

C (b) Type 304 Stainless Steel Tubing.

C 1) BAC S13AP Standard MS-flareless Sleeve

C a) Wall thickness 0.035 inches or larger:
C Use a steel MS-flareless fitting (example:
C MS21902 Union) or a commercial MS-flareless
C sleeve presetting tool (example: Boeing Tool
C ST879) for presetting the BAC S13AP sleeve on
C the tube end.

C b) Wall thickness less than 0.035 inches:
C Use the GEN2675 Hand Presetting Kit (with
C internal mandrel) for presetting the BAC S13AP
C sleeve on the tube end.

C c) Refer to Paragraph (c) following for
C presetting procedure details.

C 2) BAC S13BD Contoured Flareless Sleeve

C a) Use Harrision Model 5175 or 5720 Portable
C Hand Swaging Kit for presetting the BAC S13BD
C sleeve on the tube end.

C b) Refer to Paragraph (5) following for
C presetting procedure details.

C (c) Presetting procedure to be used with GEN 2675 Kit,
C Boeing Tool ST879 or steel MS fitting:

C 1) Select the proper size presetting tool or
C steel fitting to fit the tube OD and wall
C thickness. The internal mandrel in the GEN 2675
C Kit will be marked on the flats of the wrench
C surface for the correct tube OD/wall thickness; it
C should fit snugly (.005 max. clearance) in the
C tube's ID.

C 2) Place B nut and standard MS-flareless sleeve
C on tubing and insert tubing end into tool fitting.
C (See Fig. 809). Lubricate outer surface of sleeve
C and male threads of presetting tool or fitting
C with approved lubricant for system in which tube
C is to be used. Refer to Figures 809 and 810.

C CAUTION: NO LUBRICANT SHALL BE USED ON OXYGEN
C SYSTEM TUBE ENDS OR FLARELESS FITTING
C SLEEVES.

C NOTE: Install sleeve cutting edge toward end of
C tubing.

C 3) Check that tubing end is seated squarely in
C the tool or fitting and tighten nut.

C 4) Hold the tubing just above the nut and rotate
C slowly with thumb and fingers, at the same time
C slowly tighten the nut with a wrench. When the
C sleeve grips the tubing and prevents further
C rotation, tighten the nut an additional amount per
C following applicable steps.

C a) To preset sleeve on tubes having WALL
C THICKNESS OF 0.035 AND ABOVE, tighten nut an
C additional 7/8 to 1 full turn (one wrench flat
C = 1/6 turn).

C b) When using hand preset tool with mandrel
C and presetting sleeves on tubes having WALL
C THICKNESS OF LESS THAN 0.035 INCH, tighten nut
C an addition 1 to 1-1/6 turn (one wrench flat =
C 1/6 turn).

C c) If torque wrenches are available, tighten
C the nut to the torque value shown in Figure
C 811.

C 5) Remove presetting tool or steel fitting and
C examine tube and sleeve.

C (a) Check inside diameter at "A" is not
C reduced more than 0.015 inch. (See Fig. 811).

C (b) Check sleeve for burrs, crazing and tool
C marks.

C (c) Check the rotation and end play of the
C sleeve to the following limits:

C 1) Type 304 - 1/8 Hard Steel Tubing
C (MIL-T-6845), 21-6-9 CRES and 6061-T6 Aluminum
C Tubing: Sleeve shall not rotate freely on the
C tube under finger pressure. End play shall
C not exceed 0.006 inches maximum.

C 2) Type 304 - Annealed Steel Tubing
C (MIL-T-8504): Sleeve may rotate on tube under
C finger pressure. End play shall not exceed
C 0.015 inches maximum.

ORIGINAL AIRCRAFT TUBING INSTALLATION				REPAIR TUBING INSTALLATION RECOMMENDED		
OD X WALL THICKNESS & MATERIAL		TWA STK NBR	AIRCRAFT INSTL	OD X WALL THICKNESS & MATERIAL		TWA STK NBR
1/4 x 0.015	21-6-9	56-1739	747	1/4 x 0.035	•	56-1954
1/4 x 0.035	6061-T6	N/S	1011			
5/16 x 0.020	21-6-9	56-1770	747/1011	5/16 x 0.028	•	56-1956
5/16 x 0.035	6061-T6	56-1287	747			
3/8 x 0.020	21-6-9	56-1740	747/1011	3/8 x 0.035	•	56-0542
3/8 x 0.028	6061-T6	N/S	1011			
3/8 x 0.035	6061-T6	56-1213	747			
1/2 x 0.020	21-6-9	N/S	1011	1/2 x 0.035	•	56-0543
1/2 x 0.026	21-6-9	56-1741	747/1011			
1/2 x 0.028	6061-T6	N/S	1011			
1/2 x 0.035	6061-T6	56-1745	747			
5/8 x 0.020	21-6-9	N/S	1011	5/8 x 0.042	•	556-1955
5/8 x 0.033	21-6-9	56-1742	747/1011			
5/8 x 0.035	6061-T6	56-1215	747/1011			
3/4 x 0.020	21-6-9	N/S	1011	3/4 x 0.049	•	56-1957
3/4 x 0.039	21-6-9	56-1743	747/1011			
3/4 x 0.035	6061-T6	56-1216	747			
3/4 x 0.042	6061-T6	N/S	1011			
1.0 x 0.026	21-6-9	N/S	1011	1.0 x 0.065	•	56-1958
1.0 x 0.052	21-6-9	56-1744	747/1011			
1.0 x 0.035	6061-T6	56-1746	747			
1.0 x 0.049	6061-T6	N/S	1011			
1-1/4 x 0.028	6061-T6	N/S	1011	1-1/4 x 0.049	•	56-1959
1-1/4 x 0.032	21-6-9	N/S	1011			
1-1/4 x 0.035	6061-T6	56-1747	747			
1-1/4 x 0.065	21-6-9	56-1769	1011			
1-1/4 x 0.065	6061-T6	N/S	1011			
1-1/2 x 0.035	21-6-9	56-1768	747/1011	1-1/2 x 0.049	•	56-1960
1-1/2 x 0.035	6061-T6	N/S	747/1011			
1-1/2 x 0.033	6061-T6	N/S	1011			

*TYPE 304-1/8 HARD CRES TUBING - MIL-T-6845 SPECIFICATION

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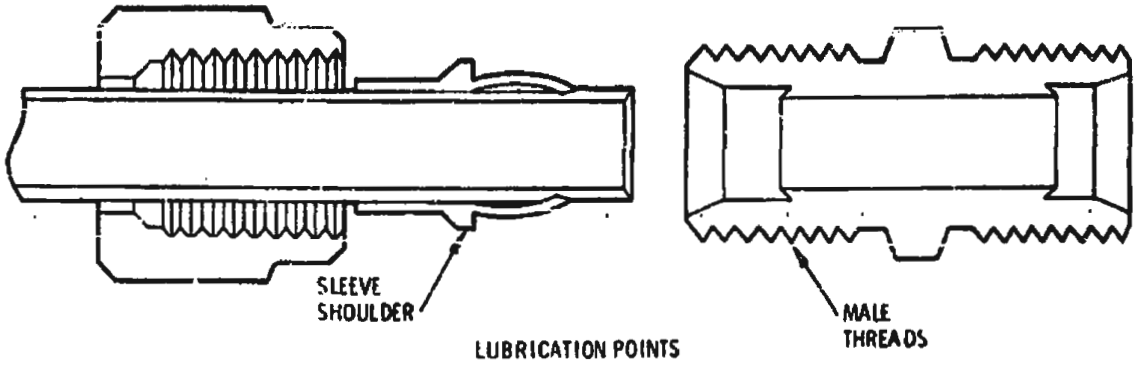
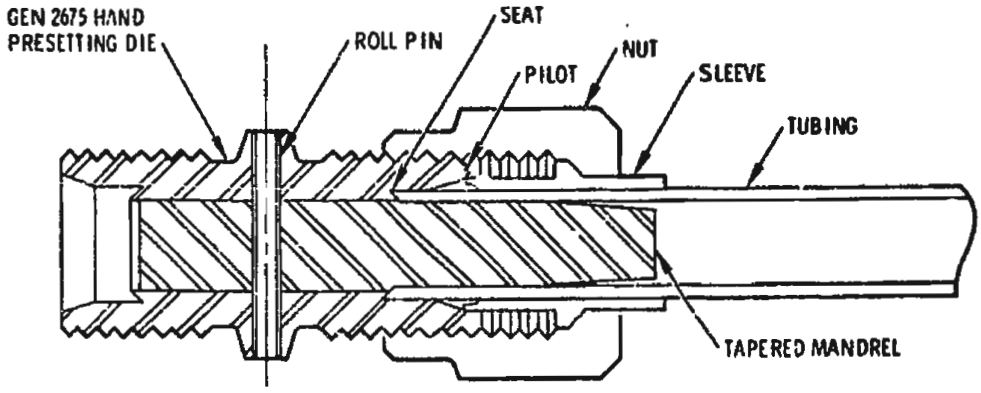
C
C

Thin wall Tubing Substitution Chart
Table 802

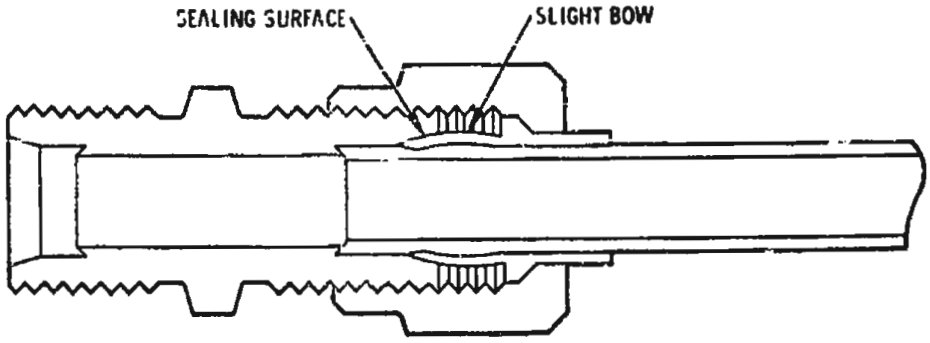
R EFFECTIVITY: ALL
R
002B



LUBRICATION POINTS



BEFORE PRESETTING



AFTER PRESETTING

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C Flairless Tubing Presetting With
C GEN 2675 Hand Presetting Die
C Figure 809

R EFFECTIVITY: ALL
R
002B

SYSTEM TYPE	APPROVED THREAD COMPOUNDS STRAIGHT THREAD FITTINGS
COMPRESSED GAS (EXCEPT O_2)	THREAD COMPOUND MIL-T-5542 OR ANTISEIZE COMPOUND TT-A-580
DEICING OR (ANTI-ICING)	
AIR CONDITIONING	1 THREAD COMPOUND MIL-T-5542
INSTRUMENT AIR	1 ANTISEIZE COMPOUND TT-A-580
PNEUMATIC	1 THREAD COMPOUND MIL-T-5542, ANTISEIZE COMPOUND TT-A-580, PNEUMATIC GREASE MIL-G-4343
FIRE PROTECTION	1 ANTISEIZE COMPOUND TT-A-580 OR GREASE MIL-G-6032
COOLANT	
WATER INJECTION	1 ANTISEIZE COMPOUND TT-A-580
FUEL	1 HYDRAULIC FLUID MIL-H-5606
LUBRICATION	
HYDRAULIC MIL-H-5606	1 HYDRAULIC FLUID MIL-H-5606
HYDRAULIC C34-1224 OR BMS 3-11	1 HYDRAULIC FLUIDS, OR SKYDROL ASSY LUBE MCS 352
HYDRAULIC MIL-H-6083	1 HYDRAULIC FLUIDS MIL-H-5606 OR MIL-H-6083
MISC TUBING	1 ANTISEIZE COMPOUND TT-A-580 OR GREASE MIL-G-6032
OXYGEN	NO THREAD COMPOUND OR ANTI-SEIZE COMPOUND SHALL BE USED ON STRAIGHT THREAD FITTINGS.

NOTE

1 WHITE PETROLEUM JELLY (TWA STK. NBR. 50-05591 MAY BE USED AS ALTERNATE WHEN ASSEMBLING FLARELESS FITTINGS ON TUBE, PROVIDED THAT TUBE, SLEEVE AND NUT ARE THOROUGHLY WASHED TO REMOVE ALL EVIDENCE OF LUBRICANT PRIOR TO INSTALLING TUBE IN AIRCRAFT SYSTEM. DO NOT USE PETROLEUM JELLY WHEN ASSEMBLING FITTINGS ON TUBING TO BE INSTALLED IN OXYGEN SYSTEM.

MI-0000-29-201

C C Flairless Tubing Assembly Lubricants
Figure 810

C NOTE: Do not force rotation of sleeve when
C checking.

C (d) Flaring of the tube end, as a result of
C presetting, shall not exceed the die cavity
C dimension.

C 6) Clean all lubricants from the tubing
C assemblies.

C CAUTION: DO NOT USE ANY SOLVENTS CONTAINING A CHLORINE
C COMPOUND, SUCH AS CHLOROTHENE,
C TRICHLOROETHANE, TRICHLOROETHYLENE AND
C FREON-BASE SOLVENTS (FREON -113), FOR
C CLEANING THE TUBE ASSEMBLIES.

C (d) Presetting procedure to be used with the
C Harrison Model 5175 or 5720 Portable Hand
C Swaging Kit.

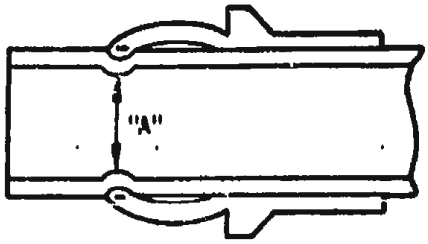
C 1) Specific and etailed instructions for
C swaging the BAC S13BD contoured flareless
C sleeve onto 21-6-9/304 - 1/8 Hard CRES and
C 6061-T6 aluminum tubing are included in a
C manual that is stored with the swaging kit.
C Instructions are also included in the
C Illustrated Tool and Equipment Manual,
C Chapters 20-11-03 and 20-11-04.

C 2) Check the depth of the innermost
C swaged groove on the ID of the tube after
C swaging to assure the presetting operation is
C satisfactory. Depth of this groove must match
C the dimension shown between the minimum and
C maximum measurements listed on the Inspection
C Criteria Table in the instructional manual.

C D. DYNATUBE Fitting and/or Tubing Assembly Replacement
C (Dynatube assy)

C In certain areas, replacement of both halves of the Dynatube
C coupling assembly with the identical parts may be required.
C Such replacement can only be performed by using the Dynatube
C Swaging Tool Kit Assembly for assembling the special fitting
C halves onto 21-6-9 CRES or 6061-T6 aluminum alloy tubing.
CR Additional Dynatube swaging tools may be used to assemble
CR fittings on the 304 1/8 hard stainless steel (CRES) tubing
CR listed in table 802.

CR NOTE: (1) Tubing inside diameter after swaging must
CR conform to dimention listed on the individual
CR tool I.D. band.



FLARELESS TUBING INSTALLATION

TUBING OD (INCH)	STEEL MIL-T-6845 TYPE 304 1/8 HARD	STEEL MIL-T-8504 MIL-T-8606 ⚠1 MIL-T-8808	STEEL CO8-1173A BMS 7-185 (21-6-9)	ALUMINUM MIL-T-7081 6061-T6
	TORQUE POUND-INCH ± 5%			
3/16	100	90	---	80
1/4	140	125	145	110
5/16	190	165	200	140
3/8	270	215	290	170
1/2	500	380	545	280
5/8	700	520	780	360
3/4	900	660	1000	450

NOTE
⚠1 TYPE 304 ANNEALED

M1-0000-29-202

C C Flairless Tubing Hand Presetting Torque Values
Figure 811

R R 0028 EFFECTIVITY: ALL

CR (2) Swaging the Dynatube coupling halves onto
CR 304 annealed stainless steel (CRES) tube
CR material is not authorized.

C A damaged fitting or tube section will be replaced by
C splicing in a length of tubing. Tube material and size for
C the splice should be the same as the connecting system
C material. Alternates may be selected from Table I if the
C proper tubing is not availabe.

C (1) Determine the following factors required for the repair
C installation:

C (a) Connecting tube system material, OD and wall
C thickness.

C (b) Availability of the Dynatube male (P/N
C MR44100-P-XX) or female (P/N MR44000-P-XX or
C MR44040-P-XX) fitting halves for the repair.
C ("XX" refers to tube OD.)

C (c) Possible use of the Dynatube Union (P/N R44101) or
C the Dynatube Adapter Union (MS-flareless to
C Dynatube, P/N R44195) fittings from TWA Stock in
C the repair.

C (d) Sufficient straight tube run exists between
C damaged fitting and the nearest bend to allow
C proper installation of repair fitting, as
C specified by Figure 812.

C (e) Adequate clearance around the tube is available
C for tool operation.

C (f) Adequate distance from a weld joint to the fitting
C sleeve tail end so that the die halves will not
C clamp the weld surface.

C (2) If applicable, disconnect coupling. Cap the mating
C fitting half.

C (3) Determine cutoff length of repair section. Minimum
C splice tube lengths are specified in Figure 813.

C (a) Minimum tube splice length depends on tube
C installation conditions. If the tube supports can
C be loosened enough to pull tube out of normal
C alignment to provide swaging tool clearance, the
C tube splice can be the minimum length type (Ref.
C Fig. 813). If the tubes cannot be loosened or
C moved, the tube splice must be long enough to

C allow swaging tool operating clearance in place
C (Ref. Fig. 814).

C (b) When replacing an intricate tubing assembly, it
C may be necessary to obtain new preformed shapes in
C multiple sections and coupling them together in
C the aircraft. Consideration of this repair method
C may dictate where the damaged section will be cut
C for removal from the aircraft.

C (4) Cut damaged section from the tube run.

C CAUTION: TUBE CUTTING SHOULD BE ACCOMPLISHED SO AS TO
C ASSURE THAT CHIPS FROM THE CUT DO NOT CONTAMINATE
C THE LINES. DEBURRING CHIPS MUST NOT BE PERMITTED
C TO ENTER OR LODGE IN THE TUBING SYSTEM.

C (5) Swage fitting(s) onto existing tubing as described in
C Chapter 20-01-06, Illustrated Tool and Equipment Manual
C or in the manual with the Kit Assembly.

C (6) Cut splice tube to length as follows:

C (a) Place mating fitting on splice tube and mark with
C ink at end of fitting; remove fitting and measure
C distance from mark to tube end.

C (b) Place both mating fittings on fittings on tube
C ends. [Ref. Step (5)].

C (c) Measure distance between fittings and add twice
C the distance obtained in Step (a). If tubing
C installation is extremely rigid, allow
C approximately 0.062 inch clearance for splice
C assembly installation.

C (7) Check splice tube section and fittings for cleanliness.

C (8) Swage fittings on splice tube ends as directed by the
C manual in the Tool Kit and/or Chapter 20-01-06, TWA
C Illustrated Tool and Equipment Manual.

C (9) If possible, pressure check the splice repair section
C before installation in the aircraft system.

C (10) Install splice section in the aircraft system and
C torque the fitting nuts per Chapter 20-29-01.

C (11) Pressurize the applicable system and check for leakage
C under full system operating pressure.

C (12) If repair section is in hydraulic system,

C (a) Bleed the system by cycling the flight controls in
C that system.

C (b) Reservice the reservoir fluid level and bleed per
C placard instructions in the Hydraulic Service
C Compartment.

C 5. Installation of Flareless Tubing Assembly - (MS-Flareless
C Connectors)

C A. Check that all parts of the assembly, sleeve, nut connector
C seat and tube are clean and free from burrs and foreign
C particles.

C B. Lubricate tubing and fittings.

C (1) Apply thread compound per the applicable system (Figs.
C 809 and 810) to the entire circumference of the male
C threads, shoulder and conical seal surface of the
C flareless sleeve immediately prior to installation.

C (2) No compound should be allowed in the interior of tube
C or bore of fitting.

C (3) Do not apply thread compound when assembling dri-lubed
C B nuts.

C CAUTION: NO LUBRICANT SHALL BE ALLOWED ON OXYGEN TUBE ENDS OR
C FLARELESS FITTING SLEEVES.

C C. Install tube assembly in connector fittings at each end.
C Insert tube assembly squarely into fittings insuring that
C sleeve is in full contact with fitting cone seat at each end
C of tube assembly. Leave the tube clamps loose to allow for
C alignment of tube in fittings.

C D. Run nut onto the fitting the first three threads by finger
C tightening; then tighten nut with wrench until a sharp rise
C in torque is noticed.

C NOTE: Sharp rise in torque indicates that the sleeve is in
C full contact with the fitting.

C Do not use B nut to wrench the tube into alignement
C or bottoming.

C E. From the point where the sharp rise in torque is noticed,
C tighten tube nut with wrench to second torque rise or 1/6 to
C 1/3 turn maximum (1/3 turn = 2 wrench flats).

C C C NOTE: When torque wrenches are available and nuts are accessible, it is suggested that nuts be torqued to values specified in Figure 815.

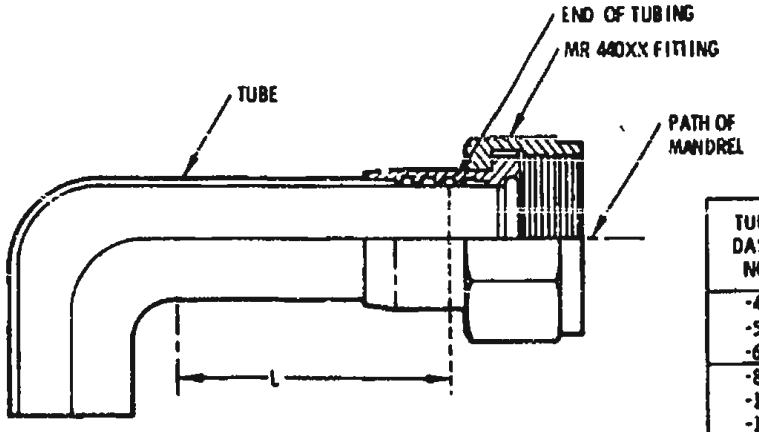
C C C C F. Nuts which are inaccessible for torque tightening may be tightened as follows. Tighten the nut until a distinct increase in torque occurs. Tighten an additional 1/6 to 1/3 (one or two hex flats) turn.

C C G. Tighten all tube clamps and return the airplane to original configuration.

C C H. Pressurize system and check for leaks per applicable system leak checks.

C 6. Correction of Leaks - Flareless fittings (MS-Connectors)

C C C C C C A. If the leaking line or hose assembly is attached to a fitting having a hexagonal section (union, adapter etc.), note the distance remaining between the end of the nut and the hex. (Ref. Fig. 815). If this dimension is 1/16 inch or less, do not attempt to re-torque. Replace the line or hose assembly or repair as specified in this Chapter.



TUBE DASH NO.	TUBE O.D. IN.	MINIMUM L IN.
-4	1/4	
-5	5/16	
-6	3/8	1.100
-8	1/2	
-10	5/8	
-12	3/4	1.252
-16	1	
-20	1-1/4	1.400

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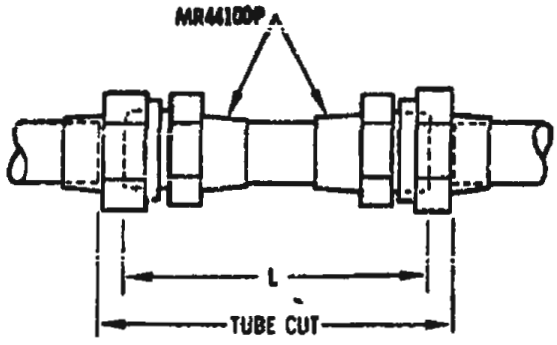
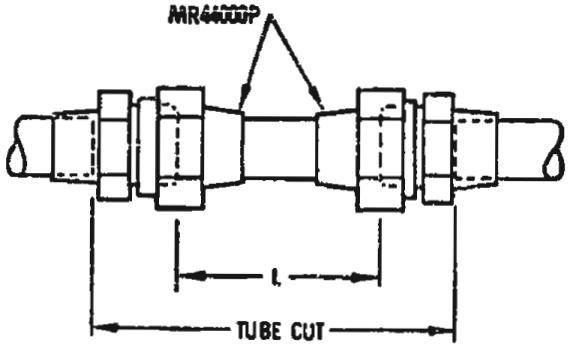
C C C Minimum Straight Tube Allowance for Swaging Near Tube Bend Figure 812

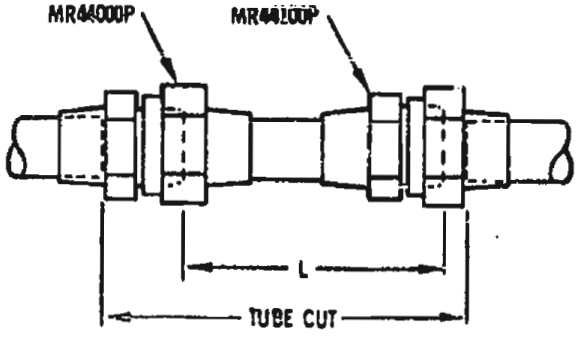
R EFFECTIVITY: ALL
R
002B



DASH NO.	TUBE OD	L	TUBE CUT
04	1/4	2.160	2.52 ± 0.03
05	5/16	2.220	2.58 ± 0.03
06	3/8	2.282	2.64 ± 0.03
08	1/2	2.800	3.17 ± 0.03
10	5/8	2.964	3.35 ± 0.03
12	3/4	3.020	3.43 ± 0.03
16	1.0	3.540	4.79 ± 0.03
20	1-1/4	3.660	4.91 ± 0.03



DASH NO.	TUBE OD	L	TUBE CUT
04	1/4	1.610	2.56 ± 0.03
05	5/16	1.610	2.62 ± 0.03
06	3/8	1.610	2.68 ± 0.03
08	1/2	2.030	3.22 ± 0.03
10	5/8	2.050	3.40 ± 0.03
12	3/4	2.050	3.48 ± 0.03
16	1.0	3.320	4.85 ± 0.03
20	1-1/4	3.314	4.96 ± 0.03



DASH NO.	TUBE OD	L	TUBE CUT
04	1/4	1.885	2.54 ± 0.03
05	5/16	1.916	2.60 ± 0.03
06	3/8	1.946	2.66 ± 0.03
08	1/2	2.415	3.20 ± 0.03
10	5/8	2.507	3.38 ± 0.03
12	3/4	2.544	3.45 ± 0.03
16	1.0	3.430	4.82 ± 0.03
20	1-1/4	3.487	4.94 ± 0.03

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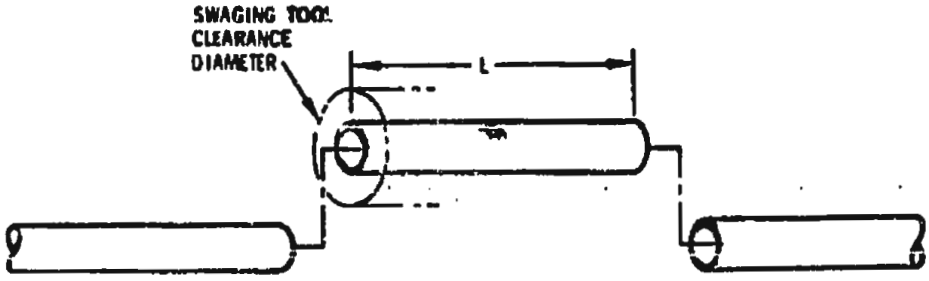
C
C

Minimum Splice Tube Length
Figure 813

R
R
002B

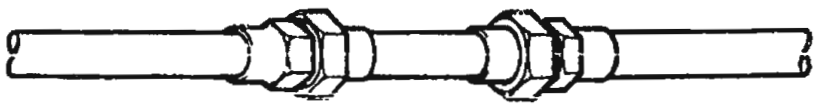
EFFECTIVITY: ALL



DAMAGED PORTION OF TUBING REMOVED

MALE FITTINGS ATTACHED

SPLICER ASSEMBLY INSTALLED



NUTS TIGHTENED

TUBE SIZE	DIMENSION "L"	SWAGING TOOL CLEARANCE DIA.
-4	7 1/2 IN.	2 IN.
-5	7 1/2 IN.	2 IN.
-6	7 3/4 IN.	2 IN.
-8	8 1/2 IN.	2 IN.
-10	9 IN.	2 1/2 IN.
-12	9 IN.	2 1/2 IN.
-16	10 1/2 IN.	3 IN.
-20	11 1/2 IN.	3 1/2 IN.

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C
C
C

Minimum Splice Tube Length
and Swaging Tool Clearance
Figure 814

R
R
002B

EFFECTIVITY: ALL

C B. If condition noted in "A" is satisfactory, leaking fittings C may be retightened by backing off the nut and then C retightening to the maximum listed torque values shown in C Figure 813, or by tightening until a distinct increase in C torque occurs. Then tighten an additional 1/6 to 1/3 turn C maximum (1 to 2 hex flats). If retightening per Paragraph C 6.A. above does not correct leak, replace the tube assembly C or repair per Paragraph 4. "Repair Procedures and C Instructions" of this Chapter/Section.

C 7. Tubing Repair Splice Installation (MS-Flareless Connectors)

C A. Splicing Tubing Defects

C (1) Measure length of defect and check that cutout will not C exceed limits in Figure 816.

C (2) Cut out section of tube as shown in Figure 816.

C (3) Install BAC S13AP or BAC S13BD flareless sleeves and C tube nuts as directed in Paragrph 4.C.

C (4) Install unions as directed in Paragraph 5.

C B. Splicing Straight Tubing Ends

C (1) Cut tube per limits in Figure 817.

C (2) Install BACS13AP or BACS13BD flareless sleeves, and C tube nuts as directed Paragraph 4.C.

C (3) Install repair splice per Figure 816 and Paragraph 5 C instructions.

C C. Splicing Tube End Fittings at Bends

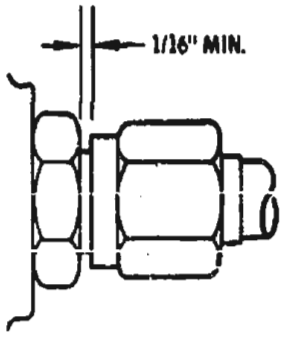
C (1) Prior to cutoff, trace tube end to duplicate bend C radius and straight length. (See Fig. 818).

C (2) Prepare tube and install BACS13AP flareless sleeves C (standard MS-flareless type) and tube nuts as directed C in Paragraph 4.C.

C (3) Install repair splice per Figure 818 and Paragraph 5.

C D. Splicing Tubing Bends

C (1) Temporary repairs of tubing bends may be made by C removing the end and installing a new bend. See C Paragraph 7.C. above for procedure.



TUBING		TORQUE RANGE - POUND-INCHES (± 5%) MIN THICKNESS (INCH)			
		CRES ALUMINUM 6061T6 TUBING ANNEALED, WITH ALUMINUM INSERTS		CRES STEEL BMS 7-185 TUBING (1) ANNEALED 1/8 HARD, WITH STEEL INSERTS	
SIZE	OD INCH	STANDARD THICKNESS	SPECIAL THINWALL	STANDARD THICKNESS	SPECIAL THINWALL
-3	3/16	80/.028		100/.020	
-4	1/4	110/.028		140/.020	
-5	5/16	140/.028		190/.020	
-6	3/8	170/.028	160/.020	270/.028	
-8	1/2	280/.028		500/.035	375/.028
-10	5/8	360/.028	250/.020	700/.049	575/.035
-12	3/4	450/.028	325/.020	900/.049	725/.042

NOTE

(1) OR LOCKHEED SPEC. COR-1173A SPEC.

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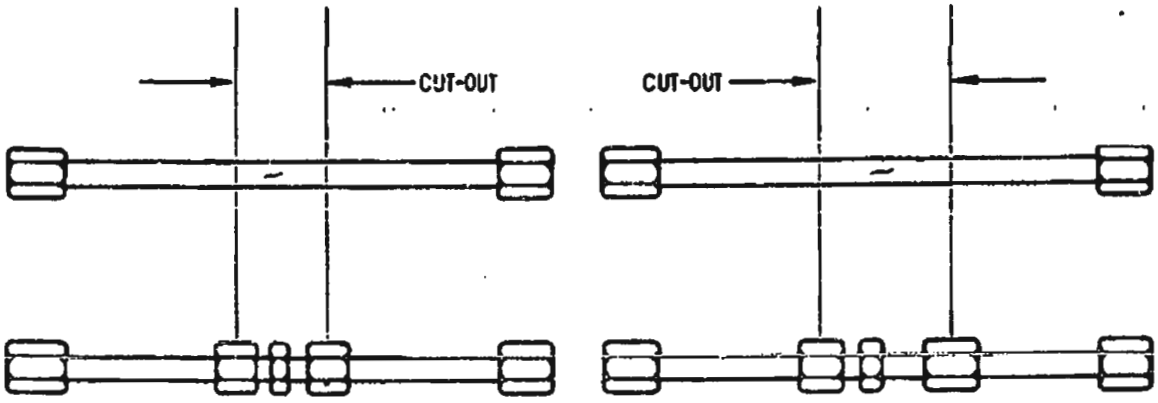
C Standard Torque Values for MS - Flareless Tube Fittings
C Figure 815

R EFFECTIVITY: ALL
R
0028



MS21902 UNION

MS21924 BULKHEAD UNION

REPAIR WITH UNIONS, CUTOUTS (INCH)									
TUBE SIZE		-4	-5	-6	-8	-10	-12	-16	-20
MS 21902	BACS13AP (1)	0.59	0.56	0.68	0.76	0.86	1.05	0.92	0.92
	BACS13BD	0.63	0.60	0.72	0.80	0.90	1.09	0.96	0.96
MS 21924	BACS13AP (1)	1.18	1.18	1.29	1.42	1.55	1.78	1.63	1.63
	BACS13BD	1.22	1.22	1.33	1.46	1.59	1.82	1.68	1.67

NOTE

(1) STANDARD MS-FLARELESS TYPE.

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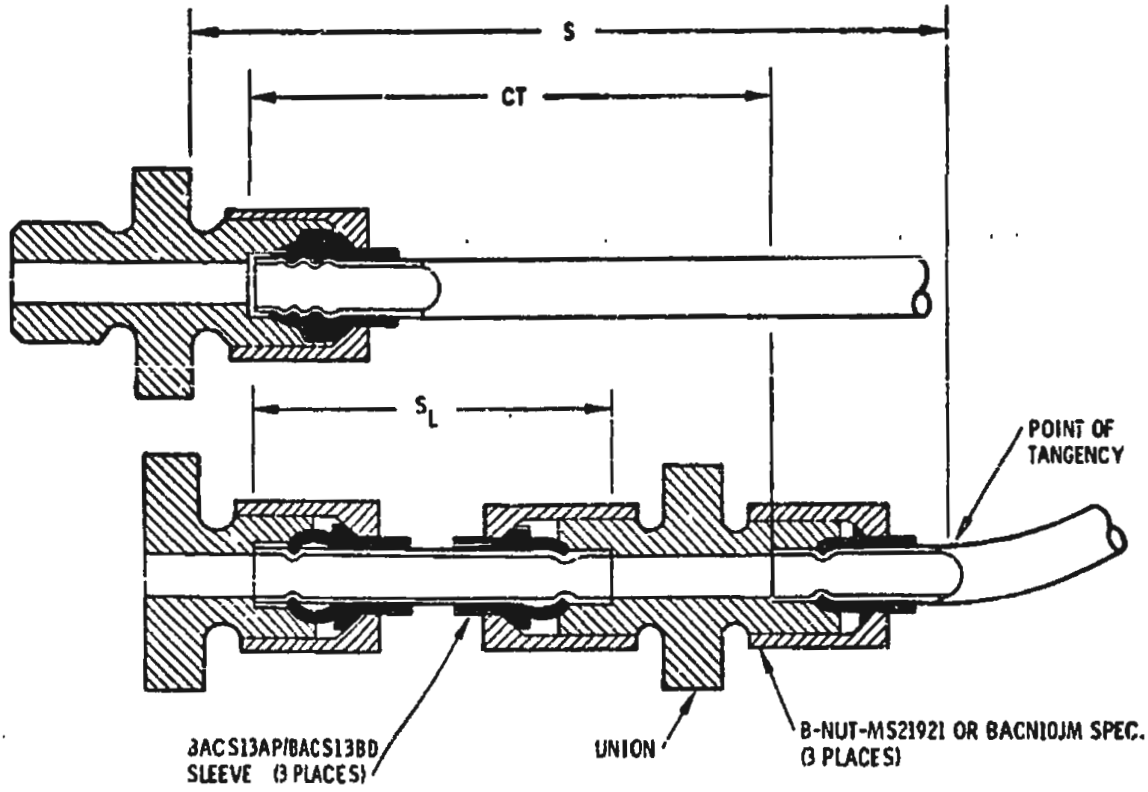
C
C

Splicing Tubine Defects
Figure 816

R EFFECTIVITY: ALL
R
002B



TUBE SIZE		TUBE CUTOFF IN INCHES								
		-3		-5	-6	-8	-10	-12	-16	-20
BACS13AP ⚠1	S	3.06	3.11	3.46	3.90	4.32	4.58	4.83	4.64	4.64
	SL	1.50	1.60	1.80	2.00	2.20	2.30	2.30	2.30	2.30
	CT	2.10	2.17	2.34	2.66	2.94	3.14	3.33	3.20	3.20

NOTE

⚠1 STANDARD MS-FLARELESS TYPE.

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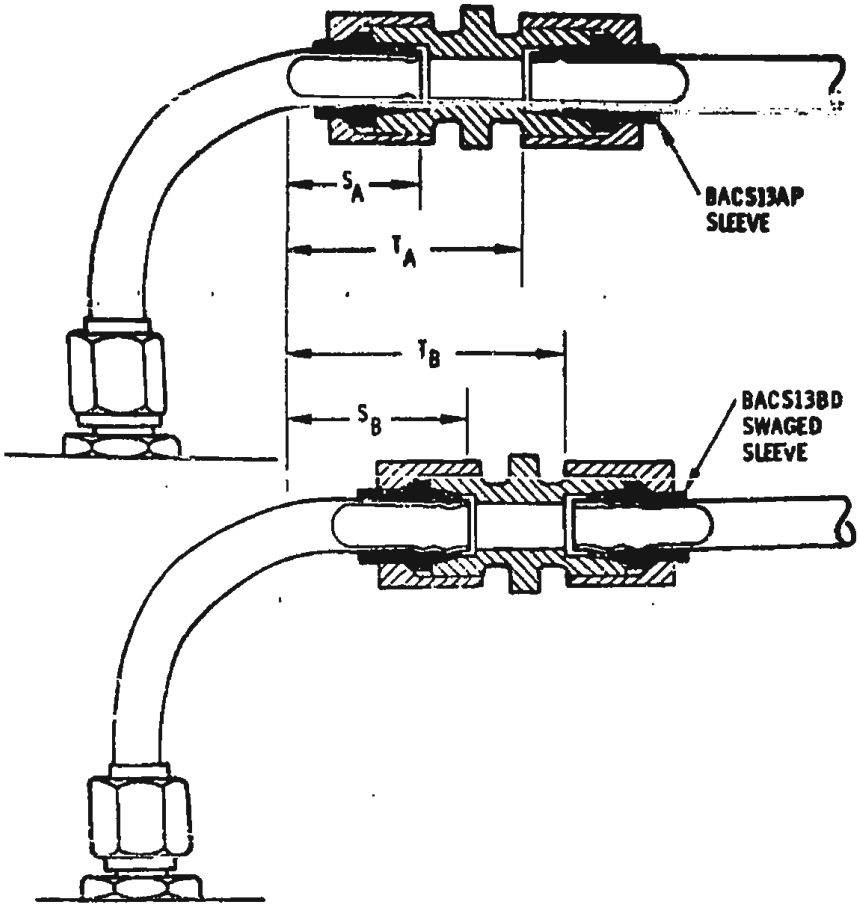
C C Splicing Straight Tubing Ends
Figure 817

R R 002B EFFECTIVITY: ALL



SPLICING AT BENDS - CUTOFF LENGTHS, (INCH)										
TUBE SIZE		-3	-4	-5	-6	-8	-10	-12	-16	-20
BACS13AP (1) SLEEVE	SA	0.75	0.80	0.90	1.00	1.10	1.15	1.15		
	TA	1.37	1.39	1.46	1.68	1.86	2.01	2.11		
BACS13BD SLEEVE	SB		1.23	1.25	1.28	1.39	1.48	1.51	1.47	1.46
	TB		1.86	1.85	1.96	2.19	2.38	2.60	2.43	2.42

NOTE

(1) STANDARD MS-FLARELESS TYPE.

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C
C Splicing Tubing End Fittings
Figure 818

R EFFECTIVITY: ALL
R
0028

C 8. Use Of The Boeing Standard BAC C42W Tube Repair Fitting

C A. General

C (1) The BAC C42W Tube Repair Fitting Assembly consists of four parts, one each BAC N10WK Nut, BAC S13BN Slide, BAC U24AM Union and BAC C24U Coupling. It will be supplied as an assembly under one TWA Stock Number for joining two ends of 1/4 (-4), 3/8 (-6), 1/2 (-8), 5/8 (-10), 3/4 (-12) and 1.0 (-16) inch OD tubing in all fluid lines EXCEPT tubing lines inside the fire zone areas of engines and APU's where unique environmental conditions are involved.

C (a) The BAC C42W Repair Fitting Assembly shall only be used to join tube ends and/or to install splice sections of the following listed tube materials:

C 1) Type 304 1/8 Hard CRES per MIL-T-6845 Specification

C 2) Type 304 Annealed CRES per MIL-T-8504 Specification

C 3) 21-6-9 "Thinwall" Steel per Boeing BMS 7-185 and Lockheed C08-1173 Specification

C 4) 6061-T6 Aluminum Alloy per MIL-T-7081 Specification

C CAUTION: DO NOT USE THE BAC C42W REPAIR FITTING FOR REPAIRS TO OXYGEN SYSTEM TUBING LINES.

C (b) When installing a splice section in the aircraft system, the material and size (OD and wall thickness) of the splice tube should be identical to the tubing system ends being joined together. However, wall thickness of one or two gauges heavier may be used. Refer to Table 802 in Chapter/Section 20-29-02 for specific recommended repair tube size substitution.

C (2) Four typical installations of the BAC C42W Assembly are shown in Figure 819. These applications provide for using the Assembly in the following ways:

C (a) Joining two ends of a tubing system with one BAC C42W Assembly.

C NOTE: The defect of chafed area in the tubing shall be a maximum of 3/8 inches wide.

C Wider defects require a splice section.

C Tube ends may have a gap of 1/4 inch width.

C (b) Installing a splice section of tubing to repair a
C damaged area exceeding 3/8 inches wide in the Tube
C OD.

C NOTE: MINIMUM length of the splice section of
C tubing shall be 4-1/2 inches.

C (c) Installing a splice section of tubing as a repair
C in a curved or irregular shaped run of the tube
C system.

C (d) Using the BAC C42W Assembly to install a repair
C section that will connect into a standard
C MS-flareless tube end fitting.

C B. Installatin Of The BAC C42W Assembly

C NOTE: (Refer to Figure 820 for relation of Steps A, B, C
C and D to the installation procedure.)

C STEP A

C (1) Remove damaged section of tubing.

C (a) Damaged or chafed area shall not exceed 3/8 inch
C width. If this area is a greater width, a splice
C section of 4-1/2 inches minimum length must be
C installed.

C (b) Maximum gap of 1/4 inch shall be permitted between
C the tube ends of the joint.

C (2) Remove burrs from OD and ID of tube ends.

C (3) Measure .580/.560 inches from the tube end toward the
C BAC N10WK Nut installation. Apply a fluid resistant
C tape wrap on the OD as shown for positioning the BAC
C U24AM Union during installation.

C NOTE: Proper location and installation of the tape
C wrap is important in assuring the centerline of
C the shoulder on the BAC U24AM Union is directly
C over the centerline of the gap between the tube
C ends.

C STEP B

C (1) Install the four parts of the Assembly onto the tubing
C with the Union against the stop provided by the tube
C wrap.

C CAUTION: DO NOT HAND TIGHTEN THE ASSEMBLY UNTIL THE UNION
C IS PROPERLY LOCATED AND SECURED IN THAT POSITION.

C STEP C

C (1) Start the Nut threads onto the mating threads on the
C Coupling. Hold the Union in its proper location while
C positioning the Slide onto the slope of the Union. Use
C the tape wrap stop as a reference point for the Union.

C (2) Tighten the Nut and the Coupling to the shoulder on the
C Union.

C STEP D

C (1) Check the assembly for satisfactory installation by:

C (a) Back off the Nut from the Assembly.

C (b) Determine whether the Slide and the Coupling edges
C nearest the shoulder of the Union are within
C .015/.000 inches of each shoulder surface.

C 1) If not, reinstall the Nut and retorque until
C the Slide and the Coupling, are within the
C .015/.000 inch gap dimension to the shoulder of
C the Union.

C (c) Check the Union to assure it is properly located
C against the tape wrap stop. Remove the tape.

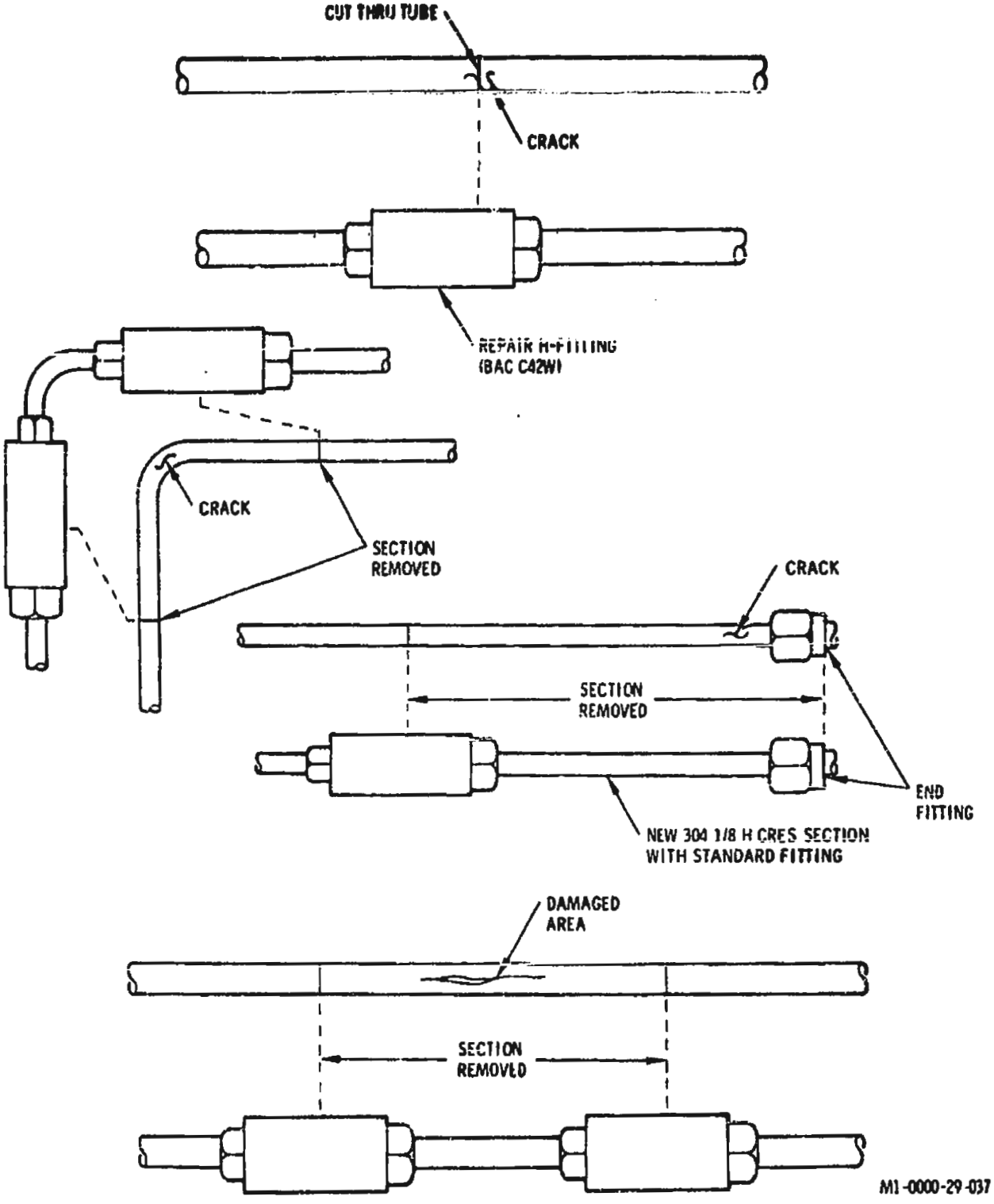
C (d) Assure the Nut is reinstalled onto the Coupling.

C (2) Pressurize the tubing system to maximum operating
C pressure. Assure that no leakage exists in the
C installation.

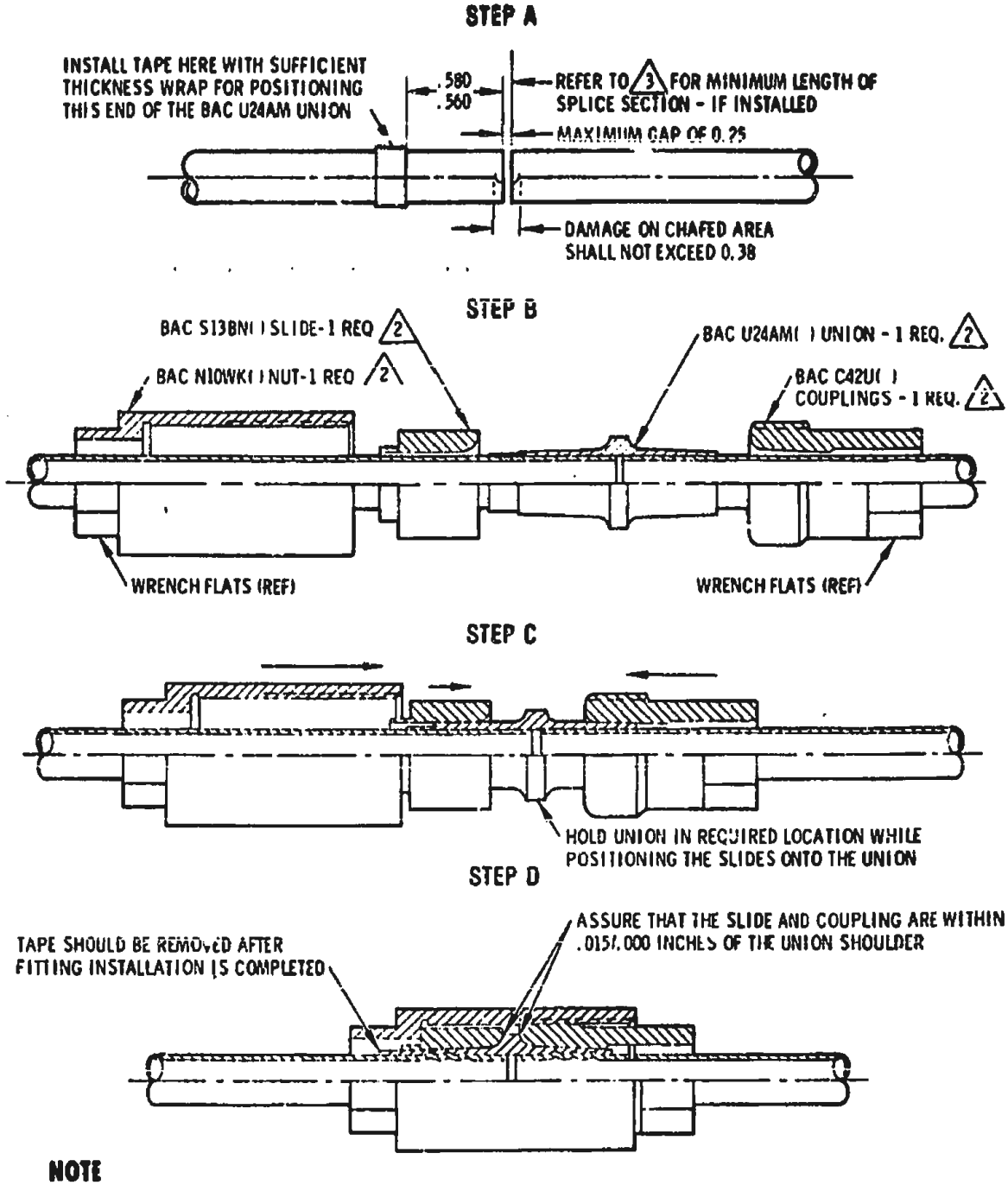
C 9. Repair Hydraulic Pressure Line, Upper Pylon Cap Area - No. 1 &
C No. 3 Engine Pylon

C A. Cutout the damaged section.

C B. Adapt P/N A01210-1 tube repair section* to fit the removed
C damaged tube section. (*TWA Stk. Nbr. 19-4623). Refer to
C Figure 821 for details and location.



C Repair Procedures Using BAC C42W Fittings
C Figure 819


STEP A
INSTALL TAPE HERE WITH SUFFICIENT THICKNESS WRAP FOR POSITIONING THIS END OF THE BAC U24AM UNION
.580
.560
REFER TO 3 FOR MINIMUM LENGTH OF SPLICE SECTION - IF INSTALLED
MAXIMUM GAP OF 0.25
DAMAGE ON CHAFED AREA SHALL NOT EXCEED 0.38
STEP B
BAC S13BN( ) SLIDE-1 REQ 2
BAC N10WK( ) NUT-1 REQ 2
BAC U24AM( ) UNION - 1 REQ. 2
BAC C42U( ) COUPLINGS - 1 REQ. 2
WRENCH FLATS (REF)
WRENCH FLATS (REF)
STEP C
HOLD UNION IN REQUIRED LOCATION WHILE POSITIONING THE SLIDES ONTO THE UNION
STEP D
TAPE SHOULD BE REMOVED AFTER FITTING INSTALLATION IS COMPLETED
ASSURE THAT THE SLIDE AND COUPLING ARE WITHIN .015/.000 INCHES OF THE UNION SHOULDER

NOTE

1. MANUFACTURER: H & W PRODUCTS, INC., RENTON, WASHINGTON 98055
2. BAC C42W TUBE REPAIR FITTING ASSEMBLY CONSISTS OF ONE EACH BAC N10WK NUT BAC S13BN SLIDE, BAC U24AM UNION AND BAC C24U COUPLING
3. MINIMUM LENGTH OF SPLICE SECTION TO BE INSTALLED BETWEEN TWO BAC C42W FITTING ASSEMBLIES - 4.5 INCHES

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C C Completed Installation of BAC C42W Tube Repair Fitting
Figure 820

R R 002B EFFECTIVITY: ALL

C. Assemble the repair section to the existing aircraft tubing system by use of one of these assemblies:

(1) Dynatube tube fitting assembly (Preferred fittings - for future replacement of repair section, if required).

(a) Dynatube male threaded connector (TWA Stk. Nbr. 70-2512) swaged onto each end of the repair section, and

(b) Dynatube nut-shoulder assembly (TWA Stk. Nbr. 70-2486) swaged on each end of the existing aircraft system.

NOTE: Install dynatube fitting components as directed by L1011 Maintenance Manual, 20-29-02, Paragraph 4.D.

(2) H-Fitting Connector Assembly

(a) Install one connector assembly (TWA Stk. Nbr. 32-7315) on each end of the repair section and connect to the aircraft system as directed by L1011 Maintenance Manual, 20-29-02, Paragraph 8.

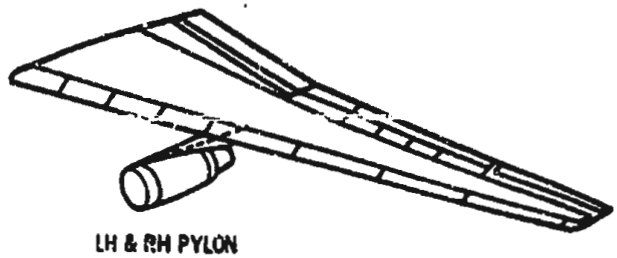
(3) MS-Flareless Fitting Assembly

(a) Install one MS-Flareless sleeve (swaged-on Stk. Nbr. 72-2131 or Std. preset Stk. Nbr. 42-9120) and one B-nut (Stk. Nbr. 72-2251) on each end of the repair section and on each end of the aircraft system.

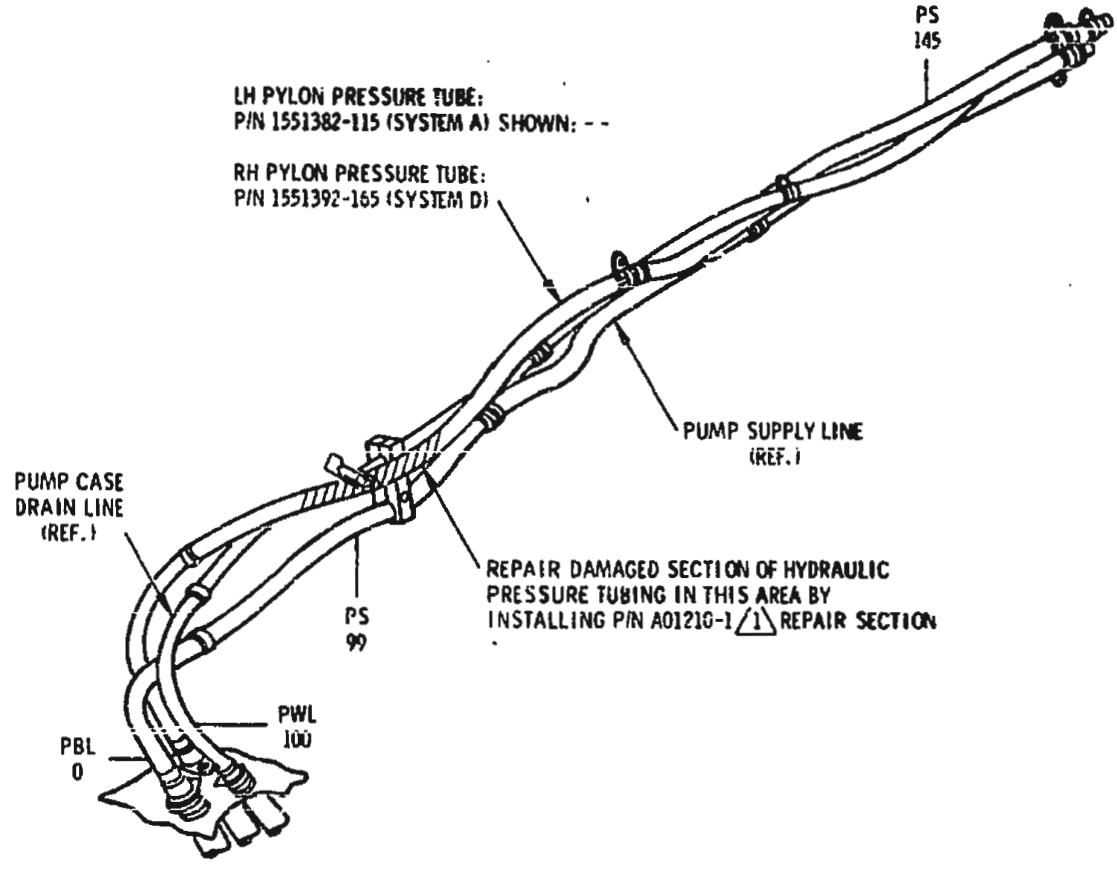
(b) Connect the repair section assembly to the aircraft system by use of one union, Stk. Nbr. 42-4478 at each end of repair section.

NOTE: Install MS-Flareless components as directed by L1011 Maintenance Manual, 20-29-02, Paragraph 4.C. and Figure 804.

D. Pressurize system and check for leaks. Correct all detected leakage.



LH & RH PYLON
UPPER CAP AREA
(REF.)



(1) TWA STK. NBR. 19-4623

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C
C Repair of Pylon Hydraulic Pressure Tubing
Figure 821

R EFFECTIVITY: ALL
R
002B

CR 10. Repair of Pinhole Leaks in Hydraulic Lines

CR CAUTION: THE REPAIR OF PINHOLE LEAKS IN HYDRAULIC LINES IS CONDITIONAL. BEFORE THE AFFECTED AIRCRAFT CAN BE DISPATCHED FOR REVENUE FLIGHT, A RELEASE MUST BE OBTAINED FROM MCIMD, AND MCIMD MUST INITIATE A FOLLOW-UP TO INSTALL A PERMANENT REPAIR AT NEXT VISIT TO A MAJOR MAINTENANCE STATION.

CR DO NOT USE PINHOLE REPAIR PROCEDURE ON FUEL, OXYGEN, OR PNEUMATIC CONTROL LINES.

CR A. General

CR (1) The following procedure may be used to repair pinhole leaks in straight accessible sections of rigid hydraulic tubing.

CR NOTE: The following repair is not permitted on a pinhole caused by wear or due to a crack. No deformation of tube is allowed; tube must be round and smooth.

CR (2) After pinhole repair is accomplished, aircraft may be dispatched in revenue service until its next visit to a major maintenance station where a permanent repair must be accomplished.

CR (3) Release is required from MCIMD prior to dispatch. MCIMD shall ensure a subsequent follow-up will be initiated to install a permanent repair.

CR B. Equipment and Materials

CR (1) Adhesive, Superglue-type - Locktite Super Bonder 415-50 (TWA Stk. Nbr. 50-1183) or equivalent.

CR (2) Clamp - AN737TW22 (TWA Stk. Nbr. 43-2370), AN737TW26 (TWA Stk. Nbr. 69-6582), or AN737TW34 (TWA Stk. Nbr. 43-0431) (use size appropriate to tube diameter).

CR (3) Washer - NAS1252-10L (TWA Stk. Nbr. 43-3065), NAS1252-416L, or AN960PD416L (TWA Stk. Nbr. 43-0370).

CR (4) O-ring - NAS1611-004 (TWA Stk. Nbr. 32-5302) (use with NAS 1252-10L washer).

CR (5) O-ring - NAS1611-007 (TWA Stk. Nbr. 42-9413) (use with NAS 1252-416L washer).

CR NOTE: Washer/O-ring combinations, other than those listed, are acceptable provided thin,

C aluminum-type washer is used with O-ring which
C fits snug in washer I.D.

C C. Repair Pinhole (Ref. Figure 822)

C (1) Wipe area around pinhole with a clean rag.

C (2) Select clamp (Ref. Item 10.B.(2)) which can be
C tightened securely on tube.

C (3) Select an appropriate washer/O-ring combination (Ref.
C Item 10.B.(3) thru (5)).

C (4) Using a convenient section of the tube as a mandrel,
C preshape washer by tightening clamp around it.

C WARNING: SUPER-GLUE TYPE ADHESIVES HAVE EXTREMELY
C RAPID CURE RATES, ARE EYE IRRITANTS, AND WILL
C BOND TO SKIN. AVOID CONTACT WITH EYES AND
C SKIN.

C (5) Apply adhesive to area surrounding hole and carefully
C center washer/O-ring combination over hole (Ref. Figure
C 822, Section A-A).

C (6) Apply adhesive to outer surface of washer/O-ring
C combination.

C (7) Carefully position unslotted portion of clamp over
C washer and O-ring and tighten. Do not disturb position
C of washer or O-ring while installing clamp.

C (8) Pressurize affected system and check repaired tube for
C leaks.

C (9) Notify MCIMC and MCIES that an aircraft has been
C repaired per this Standard Practice. Include pertinant
C details of repair as follows.

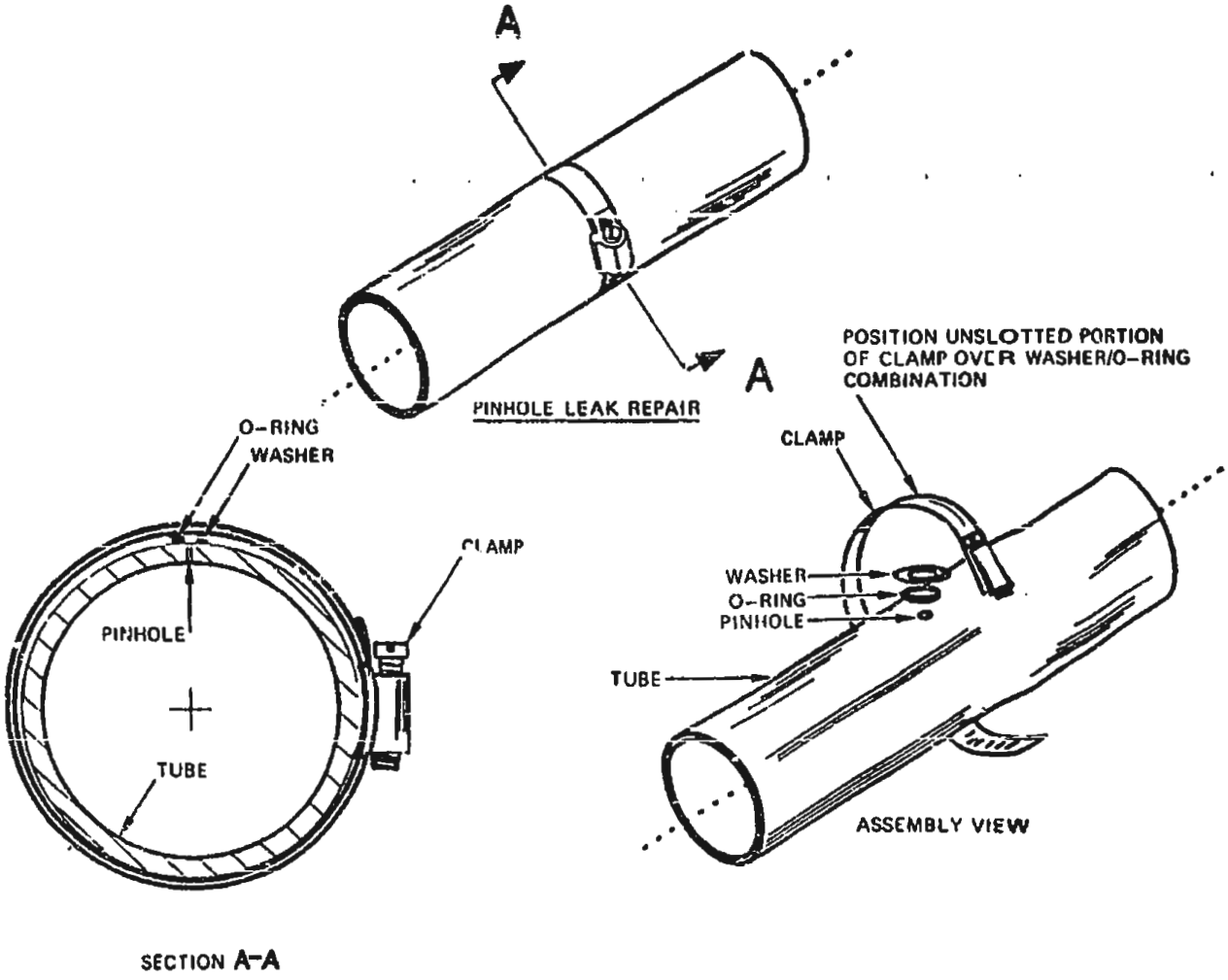
C (a) Plane number.

C (b) Repair location in the plane by parts catalog
C reference.

C (c) Part number, Mfg P/N and TWA stock number, if
C applicable.

CR 11. Potable Water Tubing and Hose Repair

CR A. Flexible Hose Repair



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C Repair of Pinhole Leaks in Hydraulic Lines
C Figure 822

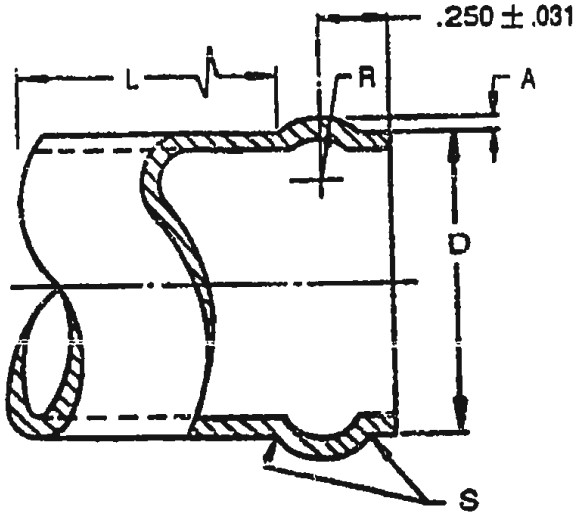
R EFFECTIVITY: ALL
R
002B

CR (1) Flexible hose damage or leaking in the hose body may be repaired by installing a 304 stainless steel splice with standard hose clamps. The steel section must contain the retaining beads as shown in Figure 823.

CR B. Tubing Repair

CR (1) Tubing damaged or leaking in the tube body may be repaired by installing a flexible hose (MIL-H-6000) splice with standard hose clamps. The tubing must contain the retaining beads as shown in Figure 823.

SIZE NO.	D TUBE OD	D TOLERANCE FOR LENGTH L TYPE A END	A ±.003 BEAD HEIGHT	L MIN LENGTH	R MAX RAD	S MAX RAD
4	1/4		.031			
5	5/16		.033			
6	3/8	+.003	.035			
8	1/2	−.010	.038	.750	.125	.062
10	5/8					
12	3/4	+.004 −.010				
16	1	+.005	.002		.156	.093
20	1−1/4	−.010				



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CR
CR

Hose Retaining Bead
Figure 823

R EFFECTIVITY: ALL
R
002B

R

STANDARD PRACTICES - INSTRUMENTS

R 1. General

R Standard practices pertaining to instruments are contained in
R this section.

PROXIMITY SENSOR ARTIFICIAL TARGET - MAINTENANCE PRACTICES

1. General

The artificial targets are used for simulated actuation and deactuation of proximity sensors as required during operational test of certain aircraft systems. Actuation of a proximity sensor, while its related target is away from the sensor, requires a sheet of steel positioned adjacent to the sensor surface. Deactuation (shading) of a proximity sensor, while its related target is adjacent to the sensor, requires a sheet of aluminum positioned between the sensor and the target.

This section covers the artificial target material required and precautionary measures to be taken in using the artificial targets.

2. Equipment and Materials

Artificial Targets (Locally Fabricated)

A. Sensor actuation target can be a section of steel hacksaw blade or a 0.050-inch thick sheet of steel slightly larger than sensor surface, with a 6-foot red streamer affixed to it.

R Targets must be used in conjunction with a plastic spacer
R between target and sensor of thickness specified in test
R procedure. Alternately on face of target, apply at least three layers of masking tape for the following reasons:

(1) Placing a bare-metal artificial target in direct contact with proximity sensor surface may introduce an actuation gap offset and may contribute to an out-of-tolerance condition.

(2) If performing proximity switch box BITE check, placing a bare-metal artificial target in direct contact with proximity sensor surface may detune the proximity switch electronics and trigger the fail-safe logic resulting in erroneous fault indication.

B. Sensor deactuation target required is a 0.050-inch thick sheet of aluminum slightly larger than sensor surface, with a 6-foot red streamer affixed to it.

3. Maintenance Practices

A. Artificial Target Usage

(1) Position artificial target adjacent to proximity sensor surface.

CAUTION: INADVERTENT MOVEMENT OF RELATED MECHANISM WHILE ARTIFICIAL TARGET IS ATTACHED TO A PROXIMITY SENSOR MAY CAUSE STRUCTURAL DAMAGE IN THE IMMEDIATE AREA.

(2) If operational test calls for attaching artificial target to proximity sensor for a period of time, ensure that related mechanism is electrically deactivated or will not be operated manually.

(3) Verify that red streamer is affixed to artificial target to assure its visibility for removal after test.

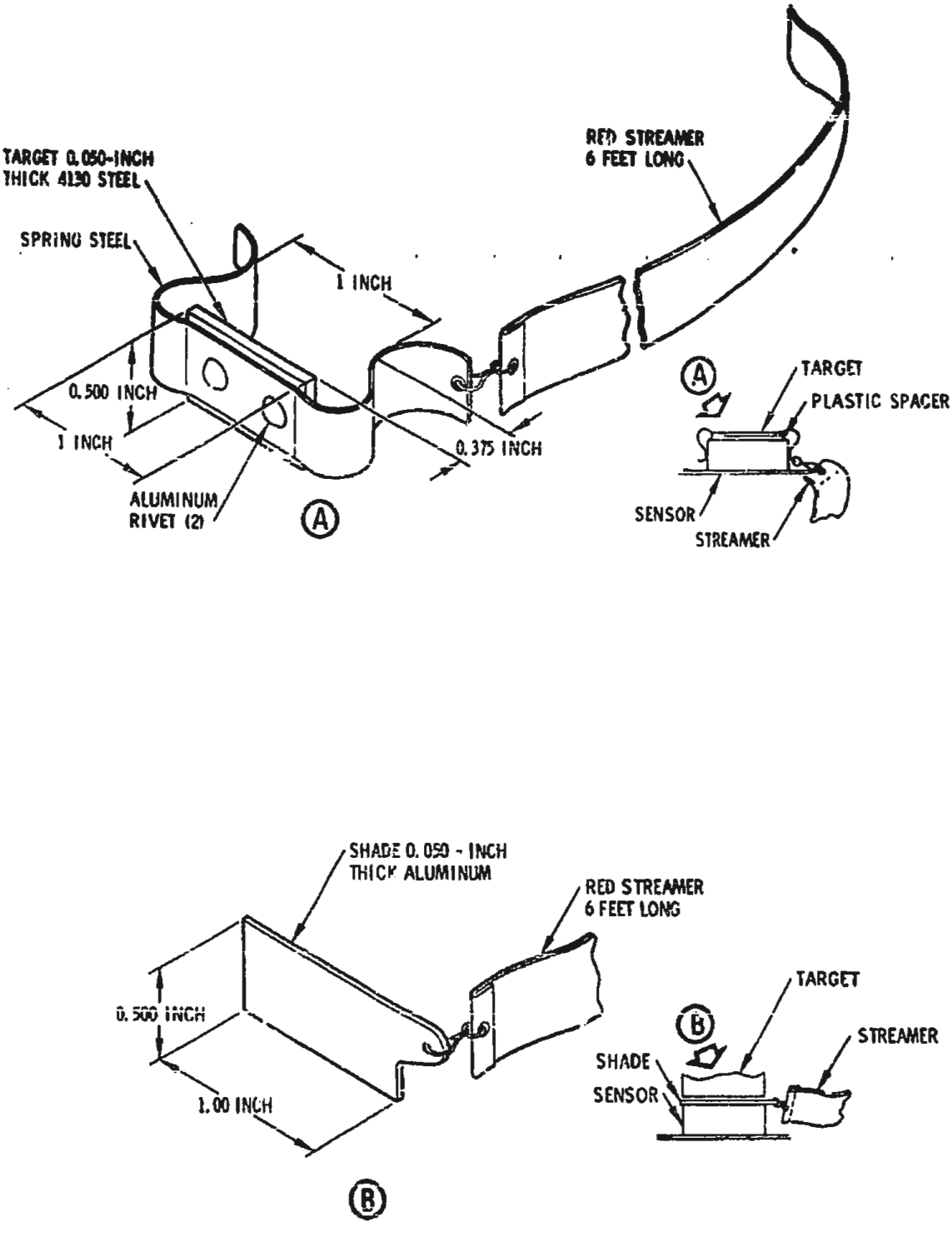
B. Post-Test Inspection

CAUTION: INADVERTENTLY LEAVING THE ARTIFICIAL TARGET IN THE SYSTEM AFTER THE TEST MAY POSE OPERATIONAL AND SAFETY HAZARDS.

(1) After a system operational test has been completed using artificial targets, ensure that proximity sensors involved are inspected to assure the artificial targets are removed.

R ### C. Target Fabrication

R Locally fabricate targets in accordance with Figure 201.



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R Position Indicating Sensor Artificial Target and Shade
R Figure 201

STANDARD PRACTICES - LIGHTS

R 1. General

R Standard practices pertaining to lights are contained in this
R section.

SWITCHLIGHT (SQUARE) - REMOVAL AND INSTALLATION

1. Referenced Procedures

20-24-02	Crimped Contact - Removal and Installation
24-41-00	External Power/Ground Service System - Maintenance Practices

2. Removal/Installation

A. Removal

CAUTION: DO NOT DEPRESS THE MANUAL SWITCHLIGHT ON THE PASSENGER OXYGEN PANEL LOCATED AT THE FLIGHT ENGINEER/SECOND OFFICERS STATION.

BEFORE REMOVAL AND/OR REPLACEMENT OF THE IDG DISCONNECT SWITCHLIGHTS (LOW PRESS), OPEN AND TAG IDG DISC CIRCUIT BREAKER (G15) ON FLIGHT ENGINEER/SECOND OFFICERS AFT CIRCUIT BREAKER PANEL CB3, ZONE 215.

BEFORE REMOVAL AND/OR REPLACEMENT OF THE RAM AIR TURBINE SWITCHLIGHT, OPEN AND TAG THE RAT MAN DEPLOY CIRCUIT BREAKER (B14) ON PILOTS OVERHEAD CIRCUIT BREAKER PANEL CB1, ZONE 210.

BEFORE REMOVAL AND/OR REPLACEMENT OF THE FUEL JETTISON MASTER SWITCHLIGHT, OPEN AND TAG JTSN ARM CIRCUIT BREAKER (U18) ON FLIGHT ENGINEER/SECOND OFFICERS AFT CIRCUIT BREAKER PANEL CB3, ZONE 215.

(1) Open and tag circuit breaker supplying electrical power to switchlight.

(2) Release panel in which switchlight is secured to gain access to rear of panel.

(3) Remove lock-wire if installed.

(4) Place switchlight in off position to extend lens assembly.

(5) Grasp lens assembly by finger indentations and pull out (Ref. Fig. 401). Allow lens assembly to hang by retainer.

(6) Turn screws in switchlight housing counterclockwise to release locking cams. Continue turning screws counterclockwise until locking cams are released.

(7) Slide mounting sleeve off switchlight housing.

(8) Remove switchlight from panel.

(9) Tag and remove wires from switchlight (Ref. 20-24-02).

B. Installation

(1) Verify that circuit breaker opened in Step 2A(1) is open and tagged.

(2) Connect wires and remove tags (Ref. 20-24-02).

(3) Install switchlight in panel.

NOTE: Black band/spacer is to be installed in front of metal panel when mounting switch on edge lighted panel, but installed behind mounting panel when switch is mounted on all other panels.

(4) Place switch guard and lock wire guard on switch as required (Ref. Fig 402).

R CAUTION: VERIFY THAT END OF SWITCH GUARD LEGS ARE EVEN WITH EDGE OF SWITCH FLANGE AND ARE NOT IN SWITCH GROOVES. PLASTIC TAB MUST REST ON SWITCH FLANGE.

(5) Slide mounting sleeve onto switchlight housing from rear of panel.

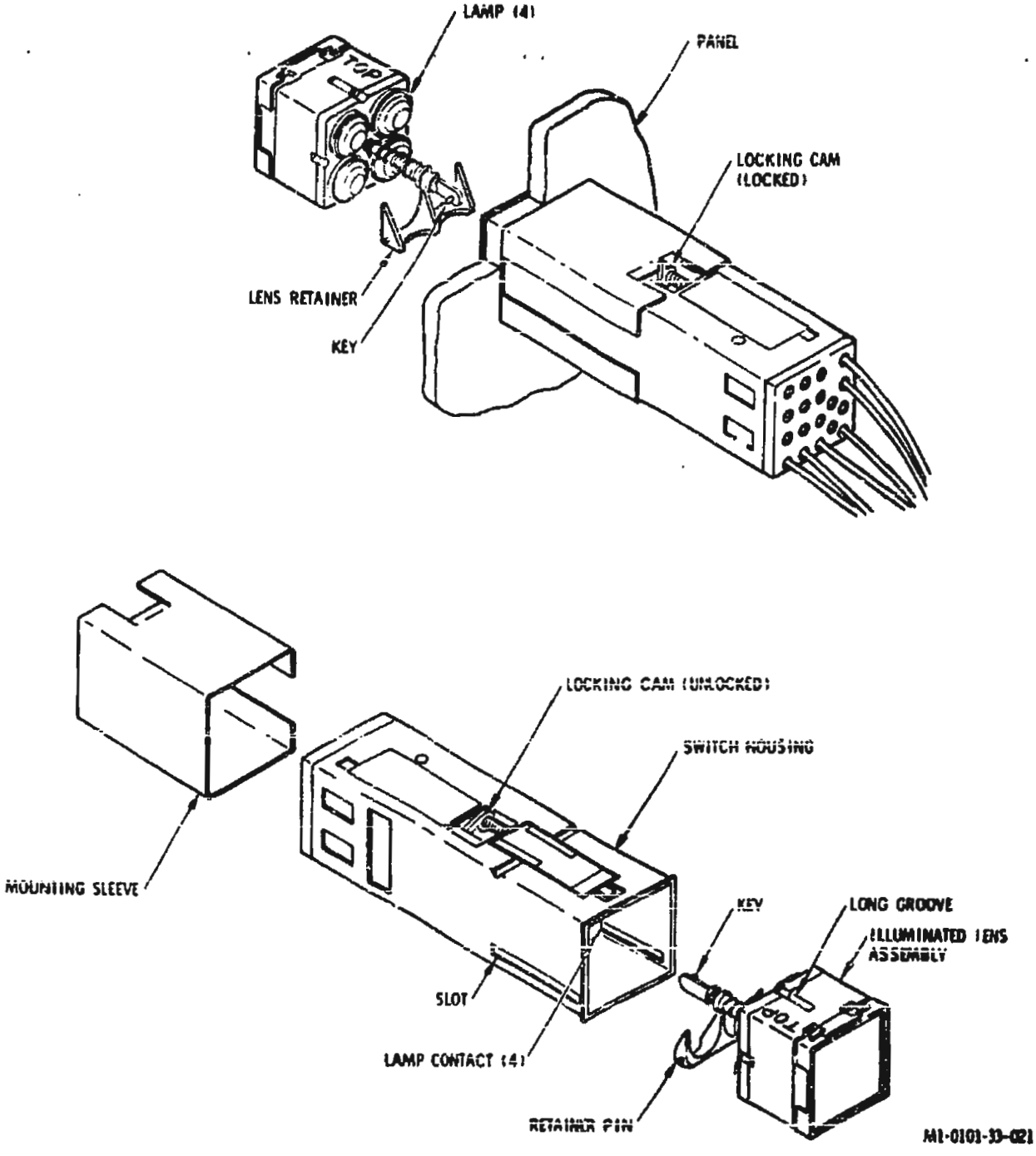
(6) With lens assembly released, turn screws in switchlight housing clockwise to engage locking cams with mounting sleeve.

NOTE: Mounting sleeve must be positioned sufficiently forward on switchlight housing to permit locking cam engagement.

(7) Continue turning screws clockwise until switchlight is secured in panel, and switch guard, if installed, is held securely. Torque value should be 1 to 2 pound inches.

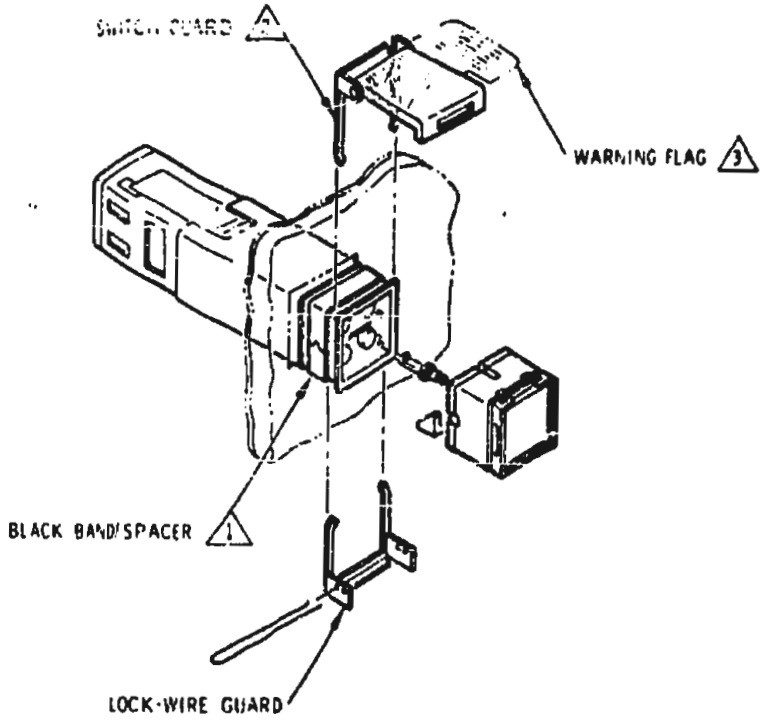
(8) Replace panel.

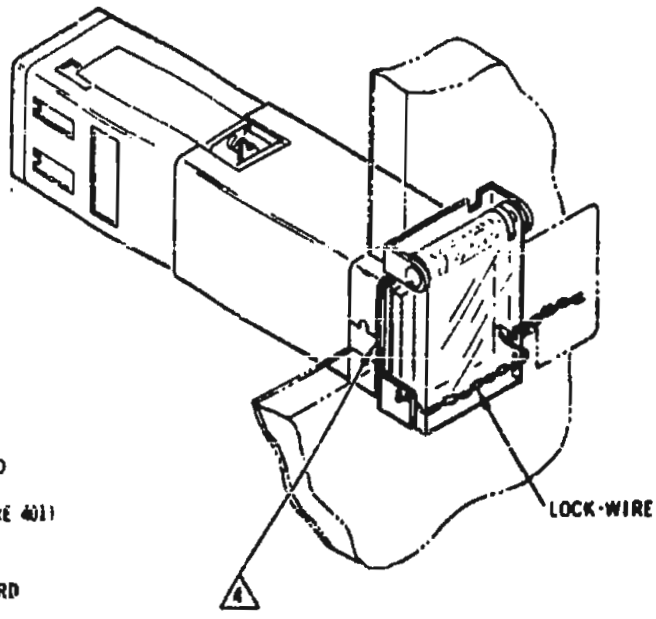
(9) Hold lens assembly with thumb and index finger and insert into switchlight housing with the placard TOP facing up.



Switchlight (Square) - Removal and Installation
Figure 401

EFFECTIVITY: 001-031 WITHOUT SB31-063





NOTE

1. SHOWN MOUNTED TO EDGE LIGHTED PANEL. WHEN MOUNTING SWITCH TO OTHER TYPE PANELS, PLACE THIS BEHIND PANEL
2. WHEN PROPERLY INSTALLED, SWITCHGUARD LEGS ARE EVEN WITH SWITCH FLANGE. DO NOT INSTALL IN SWITCH SLOT (REF. FIGURE 401)
3. WARNING FLAG NOT ON ALL GUARDS
4. WHEN REQUIRED, INSTALL LOCK-WIRE GUARD AFTER BLACK BAND SPACER AND BEFORE SWITCH GUARD SO THAT LOCK-WIRE GUARD LEGS REST AGAINST BLACK BAND SPACER AS SHOWN

M1-0101-33-752

Switchlight (Square) Guard - Removal and Installation
Figure 402

EFFECTIVITY: 001-031 WITHOUT SB31-063

R CAUTION: BEFORE CLOSING CIRCUIT BREAKER OPENED IN STEP 2A(1) MAKE CERTAIN SWITCHLIGHT IS PLACED IN OFF POSITION.

(10) Lock-wire switch guard if required.

(11) Remove tag and close circuit breaker opened in Step 2A(1).

3. Relamping

CAUTION: DO NOT DEPRESS THE MANUAL SWITCHLIGHT ON THE PASSENGER OXYGEN PANEL LOCATED AT THE FLIGHT ENGINEER/SECOND OFFICERS STATION.

BEFORE REMOVAL AND/OR REPLACEMENT OF LAMPS IN THE IDG DISCONNECT SWITCHLIGHTS (LOW PRESS), OPEN AND TAG IDG DISC CIRCUIT BREAKER (G15) ON FLIGHT ENGINEER/SECOND OFFICERS AFT CIRCUIT BREAKER PANEL CB3, ZONE 215.

BEFORE REMOVAL AND/OR REPLACEMENT OF LAMPS IN THE RAM AIR TURBINE SWITCHLIGHT, OPEN AND TAG THE RAT MAN DEPLOY CIRCUIT BREAKER (B14) ON PILOTS OVERHEAD CIRCUIT BREAKER PANEL CB1, ZONE 210.

BEFORE REMOVAL AND/OR REPLACEMENT OF LAMPS IN THE FUEL JETTISON MASTER SWITCHLIGHT, OPEN AND TAG JTSN ARM CIRCUIT BREAKER (U18) ON FLIGHT ENGINEER/SECOND OFFICERS AFT CIRCUIT BREAKER PANEL CB3, ZONE 215.

A. Switchlight (Square)

CAUTION: BEFORE RELAMPING IDG DISCONNECT (LOW PRESS) SWITCHLIGHTS ON ELECTRICAL PANEL, ZONE 215, OPEN AND TAG CIRCUIT BREAKER IDG DISC (G15) ON CIRCUIT BREAKER PANEL CB3, ZONE 215.

BEFORE RELAMPING RAM AIR TURBINE SWITCHLIGHT ON HYDRAULIC SYSTEM PANEL, ZONE 215, OPEN AND TAG CIRCUIT BREAKER RAT MAN DEPLOY (B14) ON CIRCUIT BREAKER PANEL CB1, ZONE 210.

BEFORE RELAMPING FUEL JETTISON MASTER, TANK 1, 2L, TANK 3, OR 2R SWITCHLIGHTS ON FUEL JETTISON PANEL, ZONE 215, OPEN AND TAG THE FOLLOWING CIRCUIT BREAKERS ON CIRCUIT BREAKER PANEL CB3, ZONE 215:

BEFORE RELAMPING FWD CARGO COMPT MAIN AND ALTN EXTINGUISHER DISCHARGE SWITCHLIGHT ON SMOKE AND FIRE EXT PANEL, ZONE 220, OPEN AND TAG CIRCUIT BREAKER FWD CARGO FIRE EXT (A-17, A-18) ON PILOTS OVERHEAD CIRCUIT BREAKER PANEL CB1, ZONE 210.

BEFORE RELAMPING AFT CARGO COMPT MAIN AND ALTN EXTINGUISHER DISCHARGE SWITCHLIGHT ON SMOKE AND FIRE EXT PANEL, ZONE 220, OPEN AND TAG CIRCUIT BREAKER AFT CARGO FIRE EXT (B-17, B-18) ON PILOTS OVERHEAD CIRCUIT BREAKER PANEL CB1, ZONE 210.

JTSN & DEFUEL 2L & 2R (U3)

OUTBD BOOST PUMP - 2L AND 2R (U5 AND U6)

INBD BOOST PUMP - TANK 1, 2L, 2R AND 3 (U7 THROUGH U10)

JTSN & DEFUEL - 1 AND 3 (U11 and U12)

OUTBD BOOST PUMP - 1 AND 3 (U13 AND U14)

JTSN ARM (U18)

(1) Open and tag circuit breaker supplying electrical power to switchlight.

(2) Place switchlight in off position to extend lens assembly.

(3) Grasp lens assembly by finger indentations and pull out (Ref. Fig. 401). Allow lens assembly to hang by retainer.

(4) Remove defective lamp(s) from lens assembly.

(5) Install replacement lamp(s).

(6) Hold lens assembly with thumb and index finger and insert into switchlight housing with the placard TOP facing up.

NOTE: The lens groove will also be on top when the placard TOP is facing up.

R CAUTION: BEFORE CLOSING CIRCUIT BREAKER, OPENED IN STEP 3A(1) MAKE CERTAIN SWITCHLIGHT IS PLACED IN OFF POSITION.

(7) Remove tag and close circuit breaker opened in Step 3A(1).

(8) Turn on electrical power (Ref. 24-41-00).

(9) Verify that the following circuit breakers are closed:

On pilots overhead circuit breaker panel CB1, zone 210, MISC - ANN RESET.

On Flight Engineer/Second Officers overhead circuit breaker panel CB2, zone 215, IND LT - PILOTS and F/E PANEL - UPPER and LOWER INDICATOR - F/E IND LT TEST 1, 2, 3, 4, and 5 PILOTS IND LT TEST 1, 2, and 3.

(10) Depress TEST switchlight on pilots or Flight Engineer/Second Officers LIGHTS panel and verify that replaced lamps are good.

(11) Depress TEST switchlight and verify that legend goes out.

R SWITCHLIGHT (SQUARE) - REMOVAL AND INSTALLATION

R 1. Referenced Procedures

R	20-00-01	Safetying Practices
R	20-11-26	Lacing and Tying of Wire Bundles
R	24-00-00	Electrical Power - Maintenance Practices
R R	24-00-05	Flight Engineer/Second Officers Electrical Control Panel - Removal and Installation
R R	24-41-00	External Power/Ground Service System - Maintenance Practices

R 2. Removal/Installation

R A. Removal

R CAUTION: DO NOT DEPRESS THE MANUAL SWITCHLIGHT ON THE R PASSENGER OXYGEN PANEL LOCATED AT THE FLIGHT R ENGINEER/SECOND OFFICERS STATION.

R BEFORE REMOVAL AND/OR REPLACEMENT OF THE IDG R DISCONNECT SWITCHLIGHTS (LOW PRESS), OPEN AND TAG R IDG DISC CIRCUIT BREAKER (G15) ON FLIGHT R ENGINEER/SECOND OFFICERS AFT CIRCUIT BREAKER PANEL R CB3, ZONE 215.

R BEFORE REMOVAL AND/OR REPLACEMENT OF THE RAM AIR R TURBINE SWITCHLIGHT, OPEN AND TAG THE RAT MAN R DEPLOY CIRCUIT BREAKER (B14) ON PILOTS OVERHEAD R CIRCUIT BREAKER PANEL CB1, ZONE 210.

R BEFORE REMOVAL AND/OR REPLACEMENT OF THE FUEL R JETTISON MASTER SWITCHLIGHT, OPEN AND TAG JTSN ARM R CIRCUIT BREAKER (U18) ON FLIGHT ENGINEER/SECOND R OFFICERS AFT CIRCUIT BREAKER PANEL CB3, ZONE 215.

R (1) Open and tag circuit breaker supplying electrical power R to switchlight.

R (2) Release panel in which switchlight is secured to gain R access to rear of panel (Ref. 24-00-05).

R (3) Remove lock-wire if installed.

(4) Place switchlight in off position to extend lens assembly.

(5) Grasp lens assembly by finger indentations and pull out (Ref. Fig. 401). Allow lens assembly to hang by retainer.

(6) Turn screws in switchlight housing counterclockwise to release locking cams. Continue turning screws counterclockwise until locking cams are released.

(7) Slide mounting sleeve off switchlight housing.

(8) Cut switchlight wire harness ties as required to remove switchlight from panel (Ref. 20-11-26).

(9) Pull switchlight housings through front of panel (Ref. 24-00-05).

(10) Slide blackband/spacer off each switchlight housing to allow guard removal.

(11) Slide guard off each switchlight housing.

B. Installation

(1) Verify that circuit breaker opened in Step 2A(1) is open and tagged.

(2) Install guard on switchlight housing by pressing gap in retaining loop over switchlight wires and sliding guard to the front of switchlight (Ref. Fig. 402).

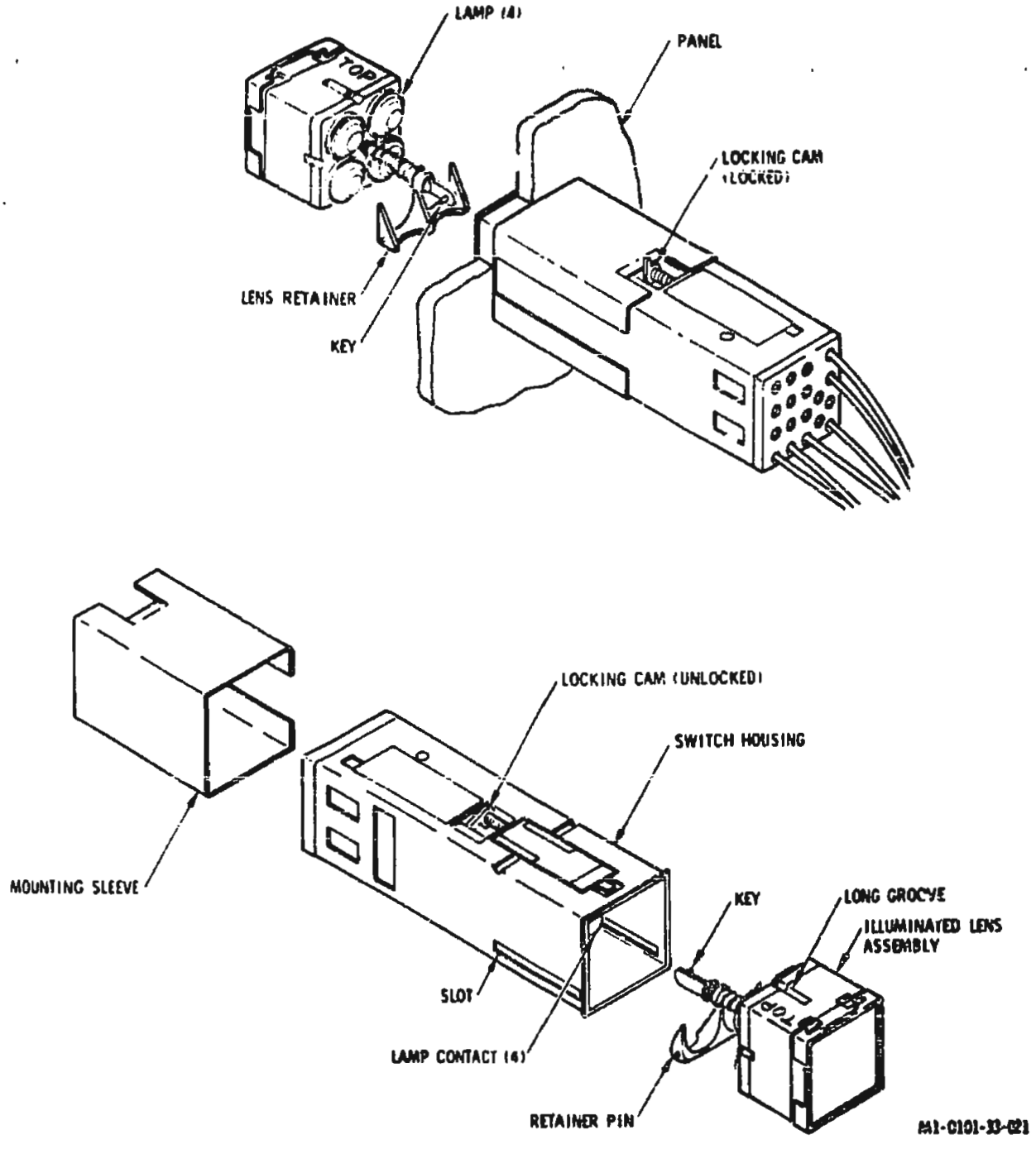
(3) Install switchlight in panel.

NOTE: Black band/spacer is to be installed in front of metal panel when mounting switch on edge lighted panel, but installed behind mounting panel when switch is mounted on all other panels.

(4) Place switch guard and lock wire guard on switch as required (Ref. Fig 402).

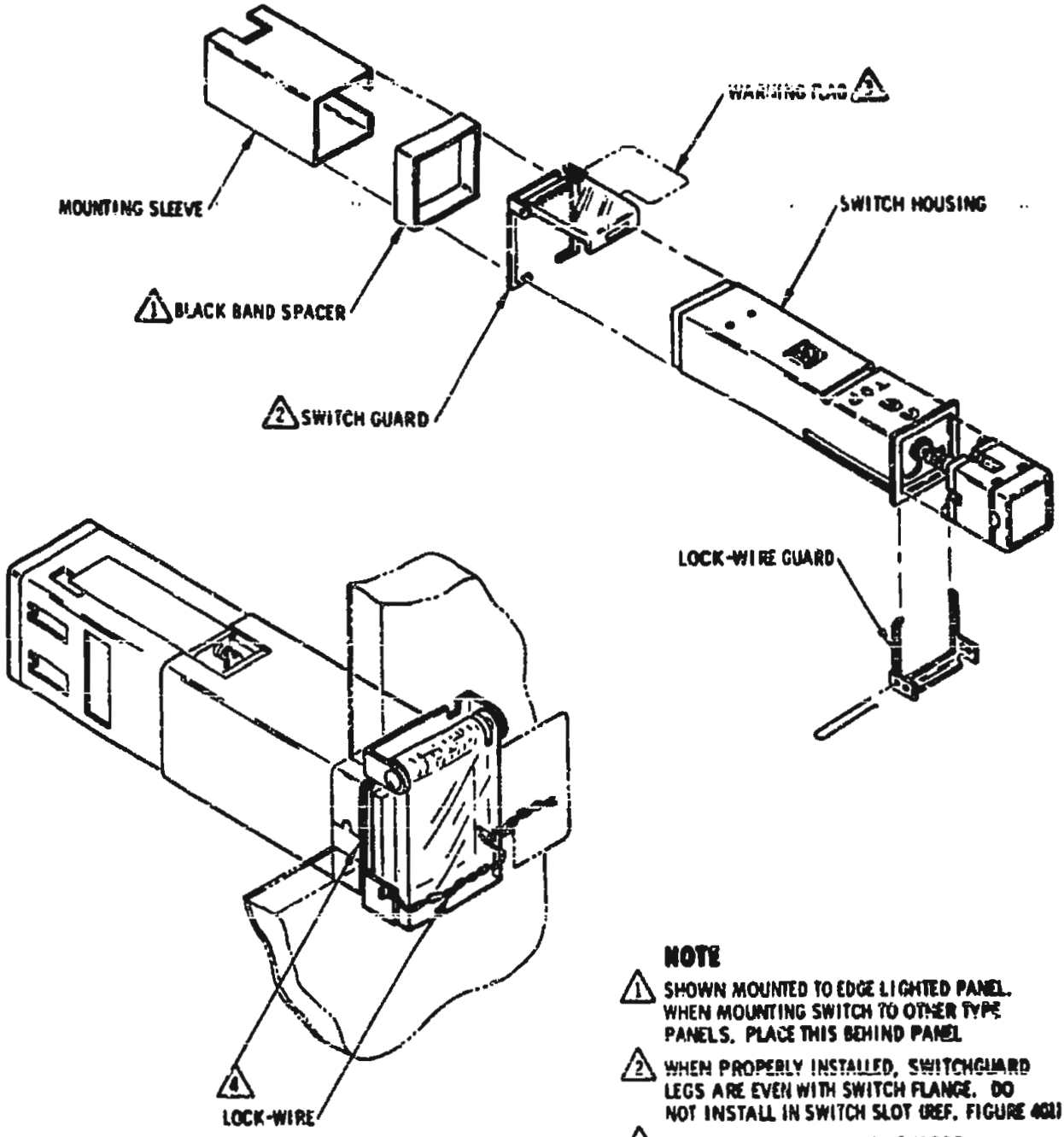
CAUTION: VERIFY THAT END OF SWITCH GUARD LEGS ARE EVEN WITH EDGE OF SWITCH FLANGE AND ARE NOT IN SWITCH GROOVES. PLASTIC TAB MUST REST ON SWITCH FLANGE.

R (5) Slide mounting sleeve onto switchlight housing from rear of panel.



R Switchlight (Square) - Removal and Installation
R Figure 401

R EFFECTIVITY: 001-031 WITH SB31-063 AND 032-999



NOTE

1. SHOWN MOUNTED TO EDGE LIGHTED PANEL. WHEN MOUNTING SWITCH TO OTHER TYPE PANELS, PLACE THIS BEHIND PANEL
2. WHEN PROPERLY INSTALLED, SWITCHGUARD LEGS ARE EVEN WITH SWITCH FLANGE. DO NOT INSTALL IN SWITCH SLOT (REF. FIGURE 401)
3. WARNING FLAG NOT ON ALL GUARDS
4. WHEN REQUIRED, INSTALL LOCK-WIRE GUARD AFTER BLACK BAND SPACER AND BEFORE SWITCH GUARD SO THAT LOCK-WIRE GUARD LEGS REST AGAINST BLACK BAND SPACER AS SHOWN

M1-0000-20-[illegible]

R Switchlight (Square) Guard - Removal and Installation
R Figure 402

R EFFECTIVITY: 001-031 WITH SB31-063 AND 032-999

0028

R (6) With lens assembly released, turn screws in switchlight housing clockwise to engage locking cams with mounting sleeve.

NOTE: Mounting sleeve must be positioned sufficiently forward on switchlight housing to permit locking cam engagement.

(7) Continue turning screws clockwise until switchlight is secured in panel, and switch guard, if installed, is held securely. Torque value should be 1 to 2 pound inches.

(8) Retie switchlight wire harnesses as required (Ref. 20-11-26).

(9) Hold lens assembly with thumb and index finger and insert into switchlight housing with the placard TOP facing up.

CAUTION: BEFORE CLOSING CIRCUIT BREAKER OPENED IN STEP 2A(1) MAKE CERTAIN SWITCHLIGHT IS PLACED IN OFF POSITION.

(10) Lock-wire switch guard if required.

(11) Replace panel removed in Step 2A(2).

(12) Remove tag and close circuit breaker opened in Step 2A(1).

R 3. Relamping

CAUTION: DO NOT DEPRESS THE MANUAL SWITCHLIGHT ON THE PASSENGER OXYGEN PANEL LOCATED AT THE FLIGHT ENGINEER/SECOND OFFICERS STATION.

BEFORE REMOVAL AND/OR REPLACEMENT OF LAMPS IN THE IDG DISCONNECT SWITCHLIGHTS (LOW PRESS), OPEN AND TAG IDG DISC CIRCUIT BREAKER (G15) ON FLIGHT ENGINEER/SECOND OFFICERS AFT CIRCUIT BREAKER PANEL CB3, ZONE 215.

BEFORE REMOVAL AND/OR REPLACEMENT OF LAMPS IN THE RAM AIR TURBINE SWITCHLIGHT, OPEN AND TAG THE RAT MAN DEPLOY CIRCUIT BREAKER (B14) ON PILOTS OVERHEAD CIRCUIT BREAKER PANEL CB1, ZONE 210.

BEFORE REMOVAL AND/OR REPLACEMENT OF LAMPS IN THE FUEL JETTISON MASTER SWITCHLIGHT, OPEN AND TAG JTSN ARM CIRCUIT BREAKER (U18) ON FLIGHT ENGINEER/SECOND OFFICERS AFT CIRCUIT BREAKER PANEL CB3, ZONE 215.

R A. Switchlight (Square)

R CAUTION: BEFORE RELAMPING IDG DISCONNECT (LOW PRESS) SWITCHLIGHTS ON ELECTRICAL PANEL, ZONE 215, OPEN AND TAG CIRCUIT BREAKER IDG DISC (G15) ON CIRCUIT BREAKER PANEL CB3, ZONE 215.

R BEFORE RELAMPING RAM AIR TURBINE SWITCHLIGHT ON HYDRAULIC SYSTEM PANEL, ZONE 215, OPEN AND TAG CIRCUIT BREAKER RAT MAN DEPLOY (B14) ON CIRCUIT BREAKER PANEL CB1, ZONE 210.

R BEFORE RELAMPING FUEL JETTISON MASTER, TANK 1, 2L, TANK 3, OR 2R SWITCHLIGHTS ON FUEL JETTISON PANEL, ZONE 215, OPEN AND TAG THE FOLLOWING CIRCUIT BREAKERS ON CIRCUIT BREAKER PANEL CB3, ZONE 215:

R BEFORE RELAMPING FWD CARGO COMPT MAIN AND ALTN EXTINGUISHER DISCHARGE SWITCHLIGHT ON SMOKE AND FIRE EXT PANEL, ZONE 220, OPEN AND TAG CIRCUIT BREAKER FWD CARGO FIRE EXT (A-17, A-18) ON PILOTS OVERHEAD CIRCUIT BREAKER PANEL CB1, ZONE 210.

R BEFORE RELAMPING AFT CARGO COMPT MAIN AND ALTN EXTINGUISHER DISCHARGE SWITCHLIGHT ON SMOKE AND FIRE EXT PANEL, ZONE 220, OPEN AND TAG CIRCUIT BREAKER AFT CARGO FIRE EXT (B-17, B-18) ON PILOTS OVERHEAD CIRCUIT BREAKER PANEL CB1, ZONE 210.

R JTSN & DEFUEL 2L & 2R (U3)

R OUTBD BOOST PUMP - 2L AND 2R (U5 AND U6)

R INBD BOOST PUMP - TANK 1, 2L, 2R AND 3 (U7 THROUGH U10)

R JTSN & DEFUEL - 1 AND 3 (U11 and U12)

R OUTBD BOOST PUMP - 1 AND 3 (U13 AND U14)

R JTSN ARM (U18)

R (1) Open and tag circuit breaker supplying electrical power to switchlight.

R (2) Place switchlight in off position to extend lens assembly.

R (3) Grasp lens assembly by finger indentations and pull out (Ref. Fig. 401). Allow lens assembly to hang by retainer.

R (4) Remove defective lamp(s) from lens assembly.

R (5) Install replacement lamp(s).

R (6) Hold lens assembly with thumb and index finger and
R insert into switchlight housing with the placard TOP
R facing up.

R NOTE: The lens groove will also be on top when the
R placard TOP is facing up.

R CAUTION: BEFORE CLOSING CIRCUIT BREAKER, OPENED IN STEP
R 3A(1) MAKE CERTAIN SWITCHLIGHT IS PLACED IN OFF
R POSITION.

R (7) Remove tag and close circuit breaker opened in Step
R 3A(1).

R (8) Turn on electrical power (Ref. 24-41-00).

R (9) Verify that the following circuit breakers are closed:

R On pilots overhead circuit breaker panel CB1, zone 210,
R MISC - ANN RESET.

R On Flight Engineer/Second Officers overhead circuit
R breaker panel CB2, zone 215, IND LT - PILOTS and F/E
R PANEL - UPPER and LOWER INDICATOR - F/E IND LT TEST 1,
R 2, 3, 4, and 5 PILOTS IND LT TEST 1, 2, and 3.

R (10) Depress TEST switchlight on pilots or Flight
R Engineer/Second Officers LIGHTS panel and verify that
R replaced lamps are good.

R (11) Depress TEST switchlight and verify that legend goes
R out.

SWITCHLIGHT (RECTANGULAR) - REMOVAL AND INSTALLATION

1. Referenced Procedures

20-24-02 Crimped Contact - Removal and Insertion

24-41-00 External Power/Ground Service System - Maintenance Practices

2. Removal/Installation

A. Removal

(1) Open and tag circuit breaker supplying electrical power to switchlight.

(2) Place switchlight in off position to extend lens assembly (Ref. Fig. 401, Views A and B).

(3) Grasp lens assembly by finger indentations and pull out (Ref. Fig. 401, View B). Allow lens assembly to hang by retainer (Ref. Fig. 401, View C).

(4) Turn screws counterclockwise to release cams (Ref. Fig. 401, View D). Continue turning screws counterclockwise until cams are released.

(5) Grasp bezel and pull out to extract switchlight from panel (Ref. Fig. 401, View E).

(6) Tag and remove wires from switchlight (Ref. 20-24-02).

B. Installation

(1) Verify that circuit breaker opened in Step 2A(1) is open and tagged.

(2) Connect wires and remove tags (Ref. 20-24-02).

(3) Slide mounting sleeve back against stop (Ref. Fig. 401, View F). Press in top and bottom spring section of mounting sleeve. Tabs of mounting sleeve must recess into openings of switchlight housing.

(4) Insert switchlight housing into panel slide legs of guard (if guard is required) beneath bezel of switch (Ref. Fig. 401 View I or K), and push bezel against panel.

R

(5) Turn screws clockwise to secure mounting sleeve against rear of panel (Ref. Fig. 401, View G) torque 1 to 2 lb in.

(6) Insert lens assembly into switchlight housing with placard TOP on the lens assembly facing up.

(7) Remove tag and close circuit breaker opened in Step 2A(1).

(8) Turn on electrical power (Ref. 24-41-00).

(9) Depress switchlight to the on position. Verify that switchlight legend comes on and that circuit continuity is established.

(10) Depress switchlight to the off position and verify that switchlight legend goes out and power is removed.

(11) Turn off electrical power (Ref. 24-41-00).

3. Relamping

A. Switchlight (Rectangular)

(1) Place switchlight in off position to extend lens assembly (Ref. Fig. 401, Views A and B).

(2) Grasp lens assembly by finger indentations and pull out (Ref. Fig. 401, View B). Allow lens assembly to hang by retainer (Ref. Fig. 401, View C).

(3) Remove defective lamp(s) from lens assembly.

(4) Install replacement lamp(s).

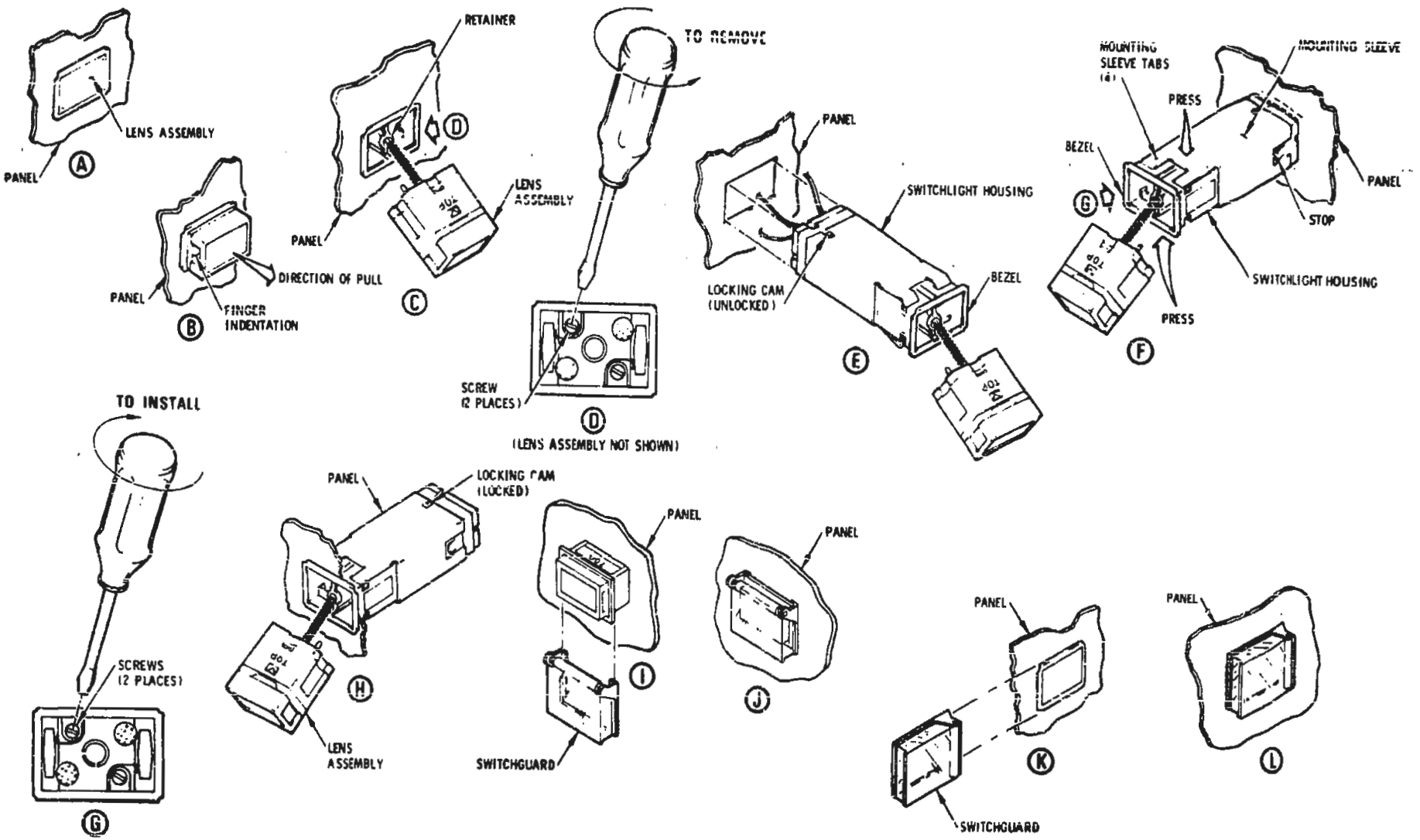
(5) Insert lens assembly into switchlight housing with placard TOP on the lens assembly facing up.

(6) Turn on electrical power (Ref. 24-41-00).

(7) Depress switchlight and verify that legend comes on.

(8) Depress switchlight and verify that legend goes out.

(9) Turn off electrical power (Ref. 24-41-00).



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R Switchlight (Rectangular) - Removal and Installation
R Figure 401

EFFECTIVITY: ALL

001B

R # INDICATOR (SQUARE) - REMOVAL AND INSTALLATION

R 1. Referenced Procedures

R 20-24-02 Crimped Contact - Removal and Insertion

R 24-41-00 External Power/Ground Service System - Maintenance Practices

R 2. Removal/Installation

R A. Removal

R (1) Open and tag circuit breaker supplying electrical power to indicator.

R (2) Release panel in which indicator is secured to gain access to rear of panel.

R (3) Grasp lens assembly by finger indentations and pull out (Ref. Fig. 401). Allow lens assembly to hang by retainer.

R (4) Turn screws in indicator housing counterclockwise to release locking cams. Continue turning screws counterclockwise until locking cams are released.

R (5) Slide mounting sleeve off indicator housing.

R (6) Tag and remove wires from indicator (Ref. 20-24-02).

R (7) Remove indicator from panel.

R B. Installation

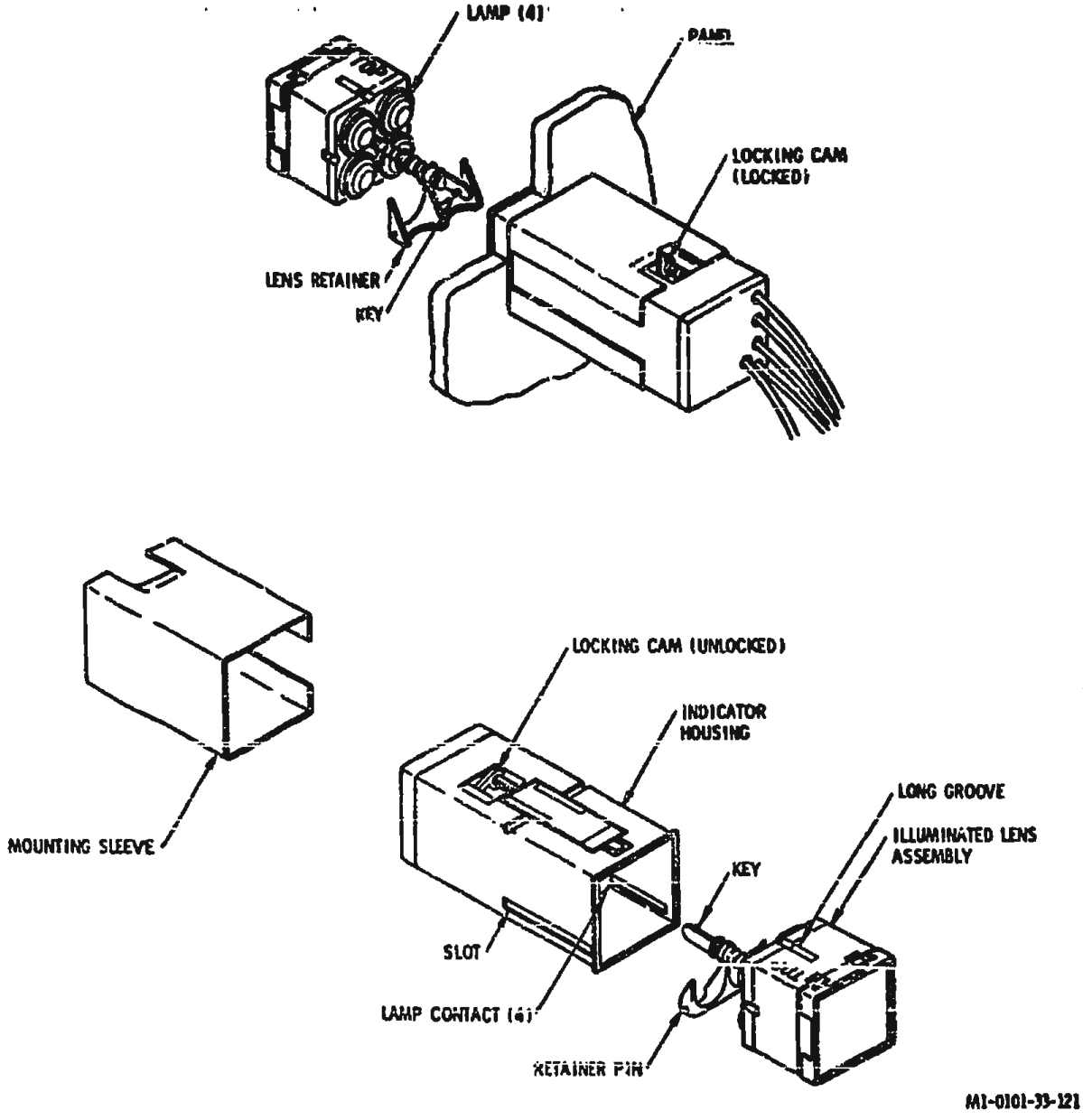
R (1) Verify that circuit breaker opened in Step 2A(1) is open and tagged.

R (2) Install indicator in panel.

R (3) Connect wires and remove tags (Ref. 20-24-02).

R (4) Slide mounting sleeve onto indicator housing from rear of panel.

R (5) With lens assembly released, turn screws in indicator housing clockwise to engage locking cams with mounting sleeve.



R Indicator (Square) - Removal and Installation
R Figure 401

NOTE: Mounting sleeve must be positioned sufficiently forward on indicator housing to permit locking cam engagement.

(6) Continue turning screws clockwise until indicator is secured in panel.

(7) Replace panel.

(8) Insert lens assembly into indicator housing with the placard TOP facing up.

(9) Remove tag and close circuit breaker opened in Step 2A(1).

(10) Turn on electrical power (Ref. 24-41-00).

(11) Apply power to circuit and verify that indicator legend comes on.

(12) Remove power from circuit and verify that indicator legend goes out.

(13) Turn off electrical power (Ref. 24-41-00).

3. Relamping

Indicator (Square)

(1) Grasp lens assembly by finger indentations and pull out (Ref. Fig. 401). Allow lens assembly to hang by retainer.

(2) Remove defective lamp(s) from lens assembly.

(3) Install replacement lamp(s).

(4) Insert lens assembly into indicator housing with the placard TOP facing up.

R NOTE: The lens groove will also be on top when the
R placard TOP is facing up.

(5) Turn on electrical power (Ref. 24-41-00).

(6) Apply power to circuit and verify that indicator legend comes on.

(7) Remove power from circuit.

(8) Turn off electrical power (Ref. 24-41-00).

R INDICATOR (RECTANGULAR) - REMOVAL AND INSTALLATION

R 1. Referenced Procedure

R 24-41-00 External Power/Ground Service System - Maintenance
R Practices

R 2. Removal/Installation

R A. Removal

R (1) Open and tag circuit breaker supplying electrical power
R to indicator.

R (2) Release panel in which indicator is secured to gain
R access to rear of panel.

R (3) Remove and tag wires.

R (4) Loosen screws securing locking tabs and rotate locking
R tabs counterclockwise (Ref. Fig. 401).

R (5) Remove mounting sleeve from rear of indicator housing.

R (6) Remove indicator from font of panel.

R B. Installation

R (1) Verify that circuit breaker opened in Step 2A(1) is
R open and tagged.

R (2) Install indicator through front of panel.

R (3) Slide mounting sleeve onto indicator housing from rear
R of panel.

R (4) Rotate locking tabs clockwise to engage the mounting
R sleeve. Tighten screws to secure the locking tabs
R against the mounting sleeve.

R (5) Connect wires and remove tags.

R (6) Remove tag and close circuit breaker opened in Step
R 2A(1).

R (7) Turn on electrical power (Ref. 24-41-00).

R (8) Apply power to circuit and verify that indicator legend
R comes on.

(9) Remove power from circuit and verify that indicator legend goes out.

(10) Turn off electrical power (Ref. 24-41-00).

3. Relamping

A. Indicator (Rectangular)

(1) Depress and release lens assembly to extend it.

(2) Grasp lens assembly by bezel and pull out. Allow lens assembly to hang by retainer.

(3) Remove defective lamp(s) from lens assembly.

(4) Install replacement lamp(s).

(5) Insert lens assembly into indicator housing.

(6) Turn on electrical power (Ref. 24-41-00).

(7) Apply power to circuit and verify that indicator legend comes on.

(8) Remove power from circuit.

(9) Turn off electrical power (Ref. 24-41-00).

R 4. Replacing Lamp Capsule

R A. Indicator (Rectangular)

R (1) Release the light latch by depressing light with
R finger.

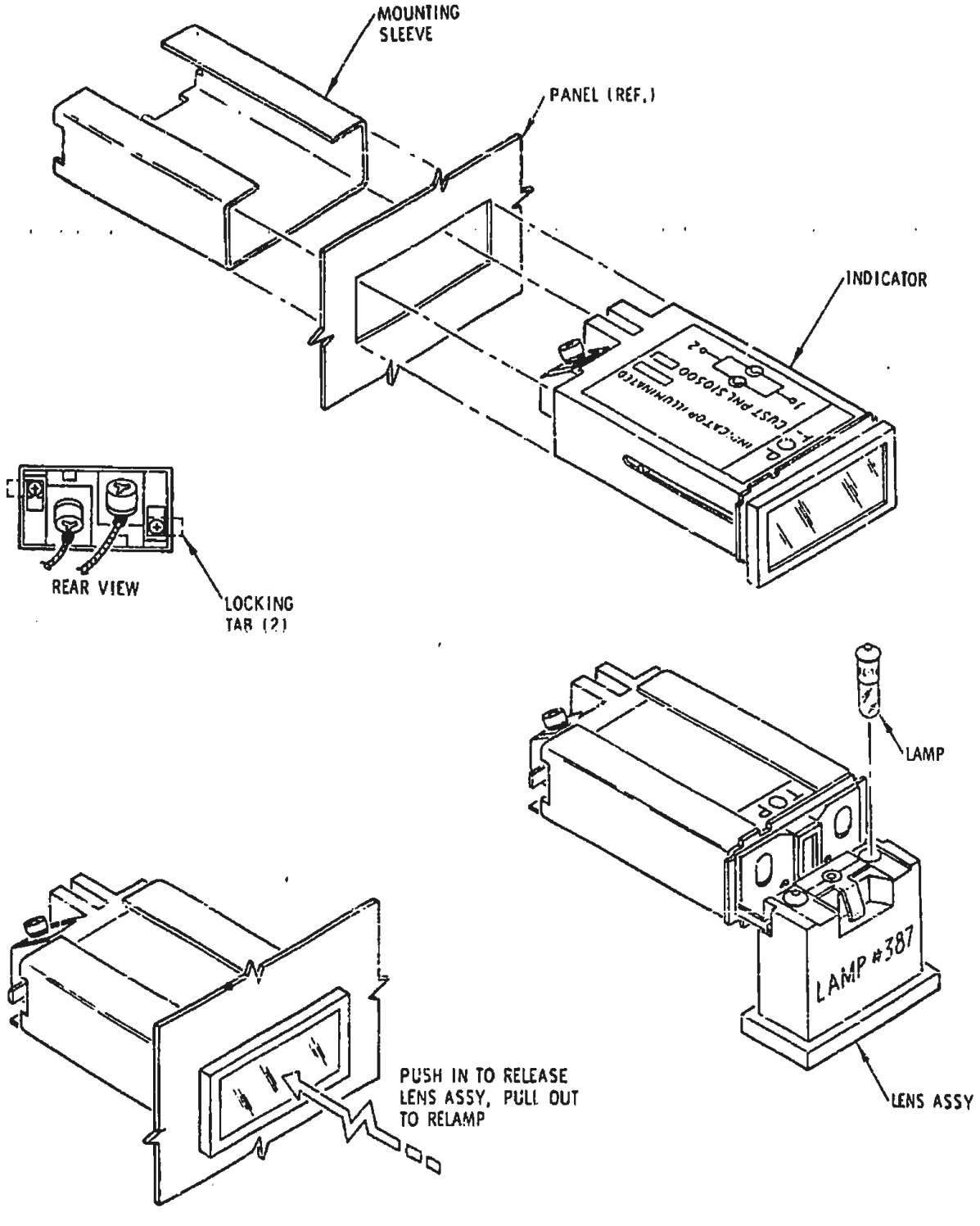
R (2) Quickly remove finger from light to allow spring
R pressure to push capsule out far enough to enable
R grasping it with fingers.

R (3) Pull capsule out until it is clear of the housing, then
R remove capsule by spreading hinge arms (Ref. Fig. 401).

R (4) Install new capsule.

R (5) Pivot new capsule down, then change lamps.

R (6) Transfer lens assembly from used capsule to newly
R installed capsule.



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R R Indicator (Rectangular) - Removal and Installation
Figure 401

R R EFFECTIVITY: ALL

R R R R NOTE: Remove lens by inserting fingernail or small tool under long side of lens and spreading slightly to pop off. Ensure lens marking reads correctly and is right side up.

R R (7) Pivot capsule up to align with housing, then depress against spring-load.

R R NOTE: An audible check is indicative that capsule is latched into housing.

R (8) Test lights using the appropriate test switch.

R R R R R NOTE: These lights are not press-to-test type and will unlatch if pressed. If a light is unlatched and will not latch when depressed, pull the capsule out, then press back in until the click is heard.

GROUND START SWITCHLIGHT - REMOVAL AND INSTALLATION

1. Relamping

   A. Switchlight

      (1) On Flight Engineer/Second Officers aft circuit breaker panel CB3, zone 215, open and tag circuit breaker START AIR VALVE (N3).

      On pilots overhead circuit breaker panel CB1, zone 210, open and tag applicable engine circuit breaker ENGINE START CONTROL (E13, E14, or E15).

      CAUTION: RELEASE SWITCHLIGHT LATCH LEVER BEFORE PULLING LENS OUT FROM SWITCHLIGHT.

      (2) Apply light finger pressure under lens assembly to depress latch lever (Ref. Fig. 401).

      (3) Pull lens out and allow it to hang by retainer.

      (4) Remove defective lamp from lens assembly.

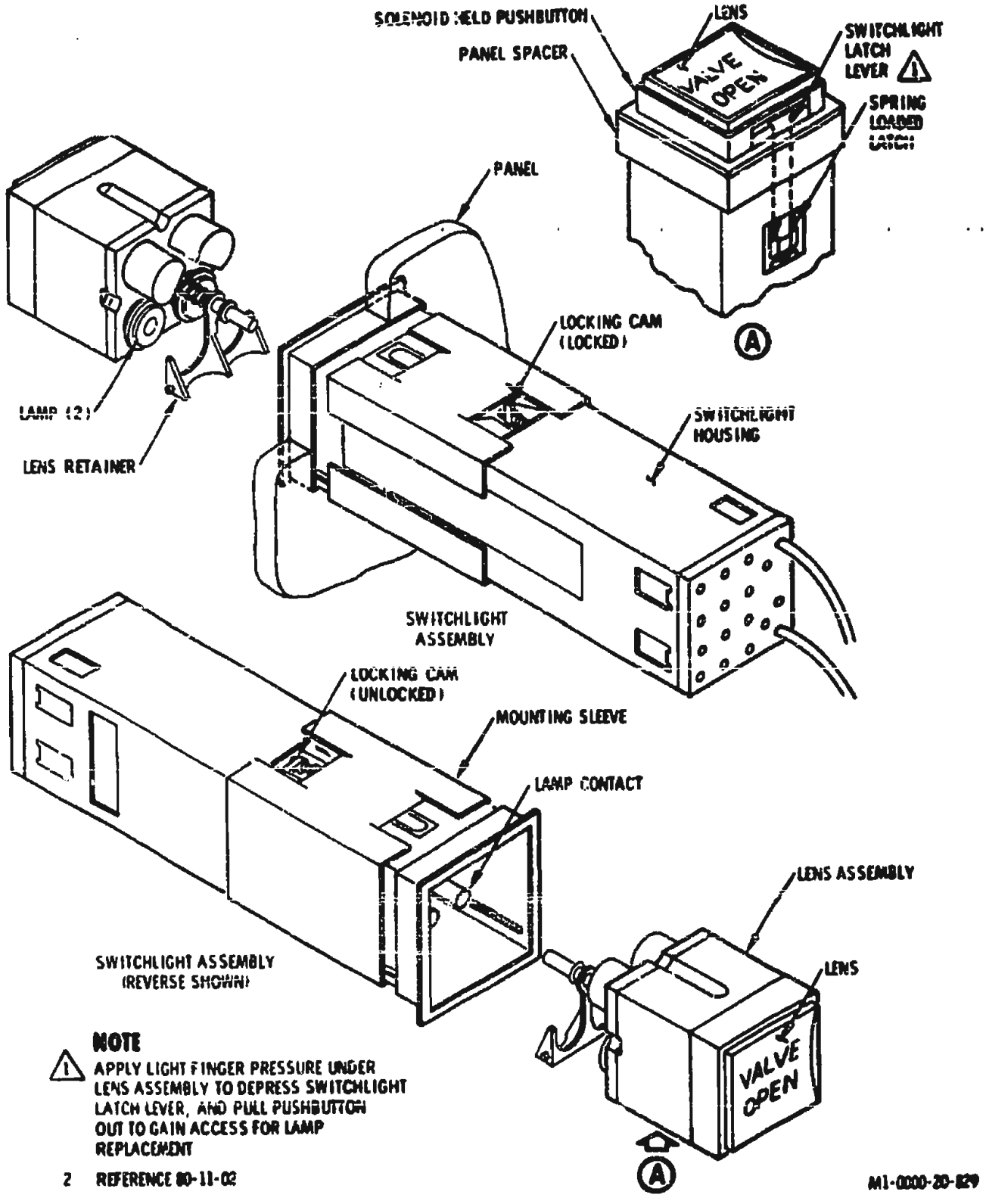
      (5) Install replacement lamp.

      (6) Hold lens assembly with thumb and index finger so that latch lever is on underside of lens and lens legend is indexed properly.

      (7) Insert lens into switchlight housing and depress lens until latch lever is secured.

R   (8) Remove tags and close circuit breaker opened in Step (1).

      (9) Depress the LIGHTS TEST switchlight on the pilots overhead panel and verify that replacement lamp is good.



NOTE

⚠ APPLY LIGHT FINGER PRESSURE UNDER LENS ASSEMBLY TO DEPRESS SWITCHLIGHT LATCH LEVER, AND PULL PUSHBUTTON OUT TO GAIN ACCESS FOR LAMP REPLACEMENT

2 REFERENCE 80-11-02

M1-0000-20-829

R
R

Switchlight - Relamping
Figure 401

STANDARD PRACTICES - PNEUMATIC

R 1. General

R Standard practices pertaining to the pneumatic system are
R contained in this section.

SINGLE T-BOLT V-BAND COUPLING - REMOVAL AND INSTALLATION

1. Removal/Installation

A. Removal

CAUTION: PUSH DYNA-GAUGE PISTON SO THAT RED BAR IS OUT OF HOUSING (REF. FIG. 401, DETAIL E).

R CAUTION: DO NOT PRY LOADED SAFETY CATCH WITH SCREWDRIVER OR
R OTHER HARD INSTRUMENT.

R (1) Lift up on safety bar while loosing nut.

R (2) Loosen nut until T-bolt unhooks from saddle and leave
R nut on T-bolt.

R CAUTION: DO NOT SPREAD COUPLING MORE THAN NECESSARY TO
R REMOVE COUPLING FROM DUCT.

(3) Slip coupling off flanges onto duct next to flange. Then, if necessary, slip coupling off duct.

B. Installation

(1) Check coupling size and type to be sure correct coupling is used.

(2) Check coupling for damage. Reject coupling with crimping, kinked strap, loose or broken spotwelds, crack or crazing in retainer cutouts, bent T-bolt, binding trunnion, or excessive spreading of retainer legs.

NOTE: Some small-sized couplings have slightly curved T-bolts.

R (3) Reject coupling without installation instruction on
R retainer or without two parallel grooves on end face of
R bolt.

(4) Remove protective caps from flanges, if installed. Check flange faces for damage.

R CAUTION: DO NOT USE COUPLING TO CORRECT DUCT MISALIGNMENT
R OR OFFSET.

R DO NOT USE COUPLING TO SUPPORT EQUIPMENT.

(5) Bring mating flanges into position (Ref. Fig. 401, Detail F). If flanges are misaligned, check ducting and correct misalignment at source.

(6) Unhook T-bolt from saddle and slip coupling over duct next to flange.

(7) With flanges in position, slip coupling over the flanges.

R CAUTION: PRIOR TO TIGHTENING COUPLING, VERIFY DUCT IS
R ALIGNED SUCH THAT A MINIMUM CLEARANCE OF 1-INCH
R BETWEEN DUCT (0.50-INCH BETWEEN DUCT INSULATION),
R DUCT CLAMP, TEE BOLTS AND NUTS, WIRE HARNESSES,
R HYDRAULIC LINES AND UNITS, SURROUNDING STRUCTURE
R AND ETC. IS MAINTAINED.

(8) Hook T-bolt into saddle.

R NOTE: Use vertical and lateral adjustments of the
R supports and/or duct rotation to maintain
R required minimum clearance.

(9) Tighten nut up to dyna-gauge housing.

(10) If nuts unloaded running torque seems high, check with torque wrench. If torque exceeds limits (1.8 lb in. minimum, 30 lb in. maximum), replace nut.

(11) Verify that dyna-gauge piston is loose in housing before torquing.

(12) Tighten nut while pressing red bar.

CAUTION: USE A PLASTIC OR RUBBER HAMMER TO TAP AROUND CIRCUMFERENCE OF COUPLING ONLY.

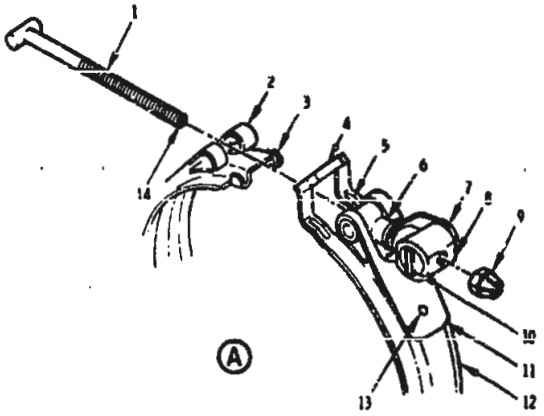
(13) When red bar slides in, stop tightening. Push piston so that red bar is out again.

Tap circumference of coupling with plastic or rubber hammer while continuing to torque.

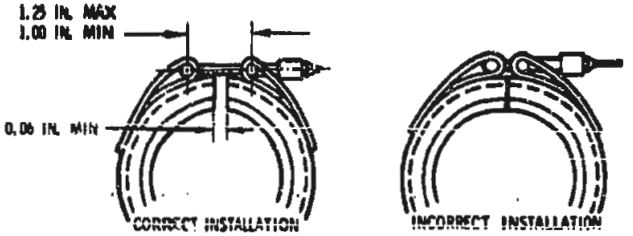
(14) Adjust torque slightly in clockwise or counterclockwise direction until piston slides in and out freely. Leave red bar in out position.

(15) Check safety latch for correct installation (Ref. Fig. 401, View D). Coupling is now properly torqued.

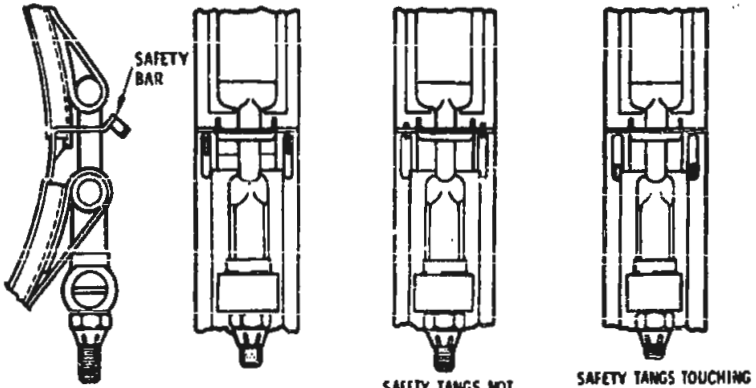
(16) If piston binds, coupling is overtorqued. If piston is loose, coupling is undertorqued.



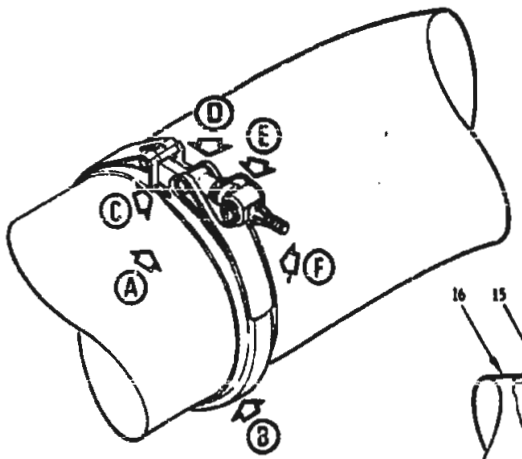
B
INSTALLATION INSTRUCTION



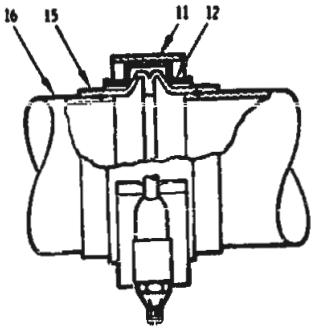
C
RETAINER CLOSURE
(SAFETY LATCH OMITTED FOR CLARITY)



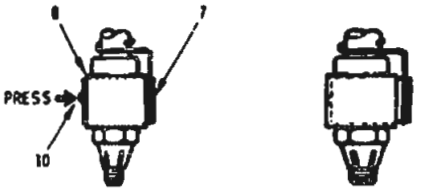
D
SAFETY LATCH



1 T-BOLT
2 T-BOLT SADDLE
3 SAFETY TANGS
4 SAFETY BAR
5 SAFETY SLOTS
6 TRUNNION
7 DYNA-GAUGE PISTON
8 DYNA-GAUGE HOUSING
9 NUT
10 RED BAR
11 STRAP
12 RETAINER
13 SPOTWELD
14 BOLT PARALLEL LINES
15 FLANGE
16 DUCT



F
CORRECT MATING OF FLANGES



E
DYNA-GAUGE LOAD INDICATOR

M1-0001-36-076

R T-bolt V-band Coupling - Removal and Installation
R Figure 401

EFFECTIVITY: ALL

001B

CAUTION: PUSH PISTON SO THAT RED BAR IS OUT OF HOUSING BEFORE LOOSENING COUPLING.

(17) If joint leaks, do not overtorque. Remove coupling and check coupling and flanges for damage.

(18) Verify that retainer closures are as shown for correct installation (Ref. Fig. 401, View C). Replace coupling if retainer or strap edges are butting.

DOUBLE T-BOLT V-BAND COUPLING - REMOVAL AND INSTALLATION

1. Equipment and Materials

   Lubricant, MIL-L-7808, or equivalent

   Torque wrench

2. Removal/Installation

   A. Removal

      (1) Lubricate thread of bolt (Ref. Fig. 401).

      (2) Loosen both nuts until nut tops are flush with bolt ends.

      (3) Unhook bolt from lug. Fail-safe link will slip over guide pins.

      (4) Remove coupling.

      (5) Slide duct back to disengage flanges.

      (6) Remove E-seal.

   B. Installation

      (1) Check duct flanges, E-seal, and all parts of coupling for damage. Replace if damaged.

      (2) Check bolt face for two grooves. Reject if missing.

      (3) Check for torque instruction decal. Reject if missing.

      (4) If unloaded nut running torque is outside torque limits (6.5 lb in. minimum, 60 lb in. maximum), replace nut.

R CAUTION: DO NOT USE COUPLING TO ALIGN DUCTS.

      (5) Install E-seal in flange and bring mating flange into position. Line up paint marks on ducts.

      (6) Unhook bolt from lug and slip coupling over duct next to flange.

      (7) With flanges in position, slip coupling over flanges.

(8) Hook bolt on lug. Fail-safe link will slip over guide pins.

(9) Lubricate bolt threads.

R CAUTION: PRIOR TO TIGHTENING COUPLING, VERIFY DUCT IS
R ALIGNED SUCH THAT A MINIMUM CLEARANCE OF 1-INCH
R BETWEEN DUCT (0.50-INCH BETWEEN DUCT INSULATION),
R DUCT CLAMPS, TEE BOLTS AND NUT, WIRE HARNESSES,
R HYDRAULIC LINES AND UNITS, SURROUNDING STRUCTURE
R AND ETC. IS MAINTAINED.

(10) Torque each nut to 80 lb in.

(11) Tap, if possible, around outside of coupling with rubber or plastic mallet to distribute band tension.

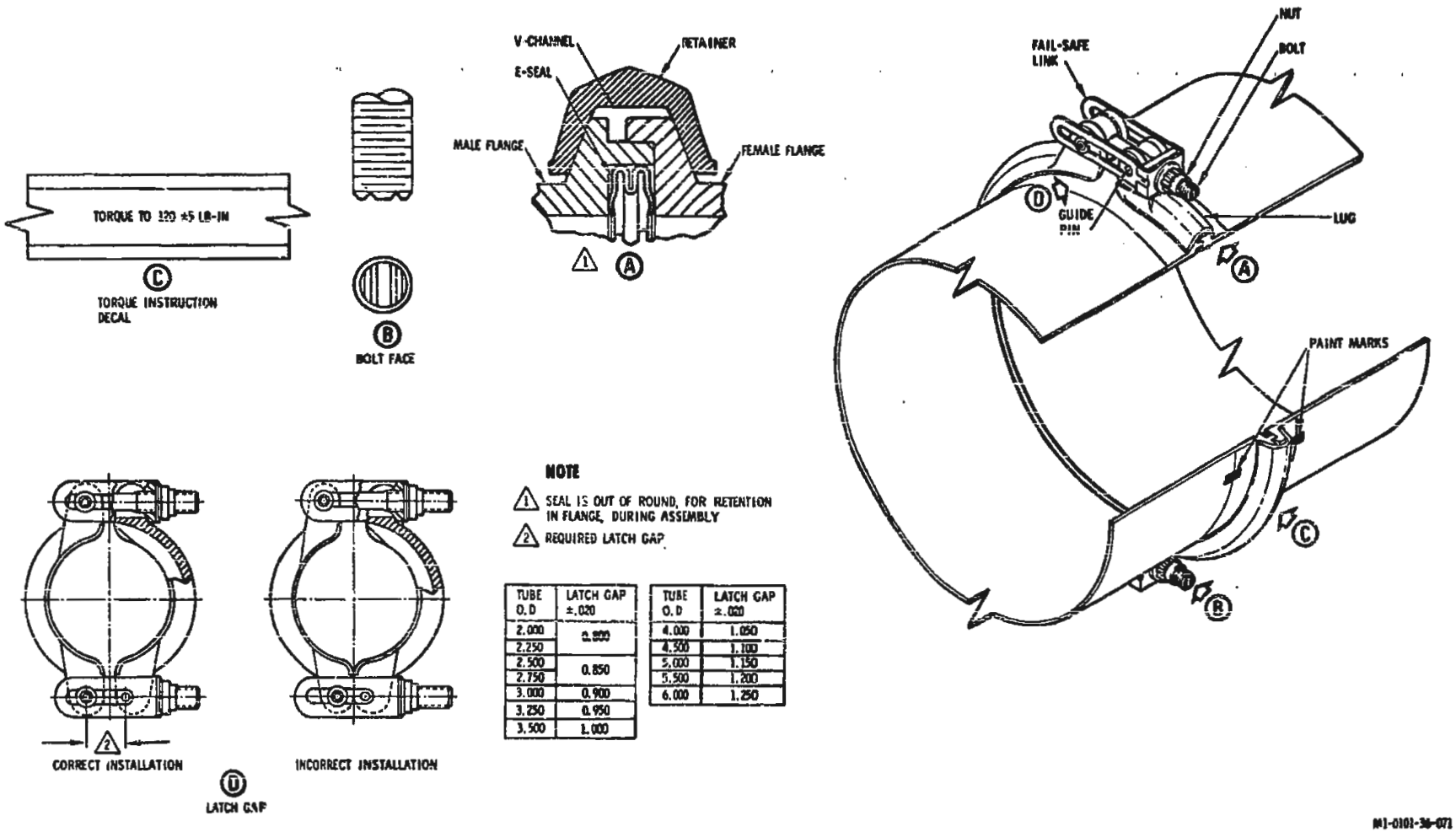
(12) Torque both nuts to 120 (±5) lb in.

(13) Verify latch gap as shown in Fig. 401. Replace coupling if closure of latch gap is below limit noted, or if butting of lugs occurs before required torque is reached.

NOTE: If joint leaks, do not overtorque. Remove coupling and check coupling, flanges, and seal for damage or duct misalignment.

R Use vertical and lateral adjustments of the
R supports and/or duct rotation to maintain
R requied minimum clearance.

(14) If coupling is in duct run with many couplings, torque each coupling progressively until all couplings have been torqued to 120 (±5) lb in.



NOTE

1. SEAL IS OUT OF ROUND, FOR RETENTION IN FLANGE, DURING ASSEMBLY
2. REQUIRED LATCH GAP

TUBE O.D	LATCH GAP ±.020
2.000	0.800
2.250	
2.500	0.850
2.750	
3.000	0.900
3.250	0.950
3.500	1.000

TUBE O.D	LATCH GAP ±.020
4.000	1.050
4.500	1.100
5.000	1.150
5.500	1.200
6.000	1.250

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R Double T-bolt V-band Coupling - Removal and Installation
R Figure 401

EFFECTIVITY: ALL

0018

STANDARD PRACTICES - STRUCTURE

R 1. General

R Standard practices pertaining to structure are contained in this
R section.

BOLTS AND SCREWS - MAINTENANCE PRACTICES

R 1. General Maintenance Practices

R A. Install bolts and screws with heads in an upward or forward R direction. Install nuts so that not less than 1/32 inch of R bolt or screw shall extend through nut. When used with R chamfered end bolts and screws, full chamfer shall extend R through nut. Wrench torque values for installation are R shown in Figure 202. Tighten bolt or screw to higher value R listed within a tolerance of +0, -10 percent when torque is R applied from head side. Replace installed bolt, screw or R nut, if any torque values are exceeded.

R B. Torque values listed in Figure 202 provide data for R tightening all types of threaded fasteners, both lubricated R and nonlubricated. Restricted access often requires use of R an adapter having a torque length "B". This condition R requires corrected torque wrench reading "T" (Ref. Fig. R 201).

R NOTE: Where there is an apparent easy turning or excessive R drag when installing nut on bolt, nut should be R removed and tested (Ref. Fig. 202).

R Self-locking mechanism of nuts and nutplates develop R minimum locking torque at room temperature (Ref. Fig. R 203).

R C. Torque values are given in Figure 204 for reduced head R bolts.

R D. Torque values are given in Figure 204 for rigid tube R coupling connector.

R E. Torque values are given in Figure 204 for pipe thread R fittings.

R F. Torque values are given in Figure 205 for low pressure and R return line fittings.

R G. Torque values are given in Figure 206 for high pressure line R fittings.

R H. Torque values are given in Figure 207 for hose and duct R clamps.

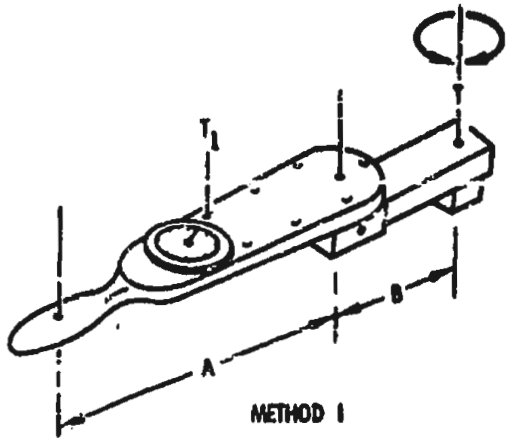
$$T_1 = \frac{TA}{A+B}$$

A = TORQUE LENGTH OF TORQUE WRENCH
B = TORQUE LENGTH OF ADAPTER
T = ACTUALL TORQUE OF NUT
T_1 = INDICATED TORQUE OF WRENCH (CORRECTED TORQUE)

EXAMPLE A = 12 INCHES
B = 3 INCHES
T = 160 POUND-INCHES

$$T_1 = \frac{160 \times 12}{12+3}$$

T_1 = 128 POUND-INCHES



METHOD I

USING HANDLE EXTENSION ONLY, NO CORRECTION NECESSARY.

METHOD II

USING ADAPTER WITH EXTENSION BETWEEN ADAPTER AND WRENCH BOTH IN LINE WITH WRENCH. INDICATED TORQUE T_1.

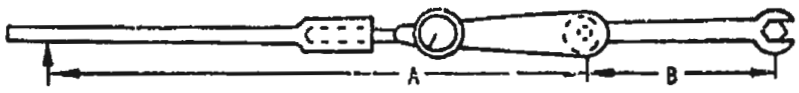
$$T_1 = \frac{TA}{A+B}$$

METHOD III

USING BOTH HANDLE EXTENSION AND ADAPTER. INDICATED TORQUE T_1:

$$T_1 = \frac{TA}{A+B}$$

METHOD IV

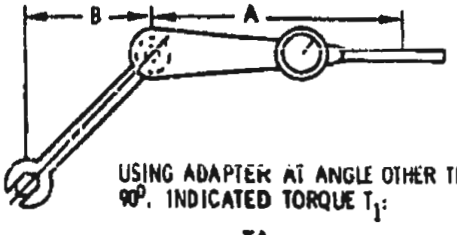


THE FOLLOWING METHODS SHOULD BE AVOIDED WHERE POSSIBLE. WHEN NECESSARY TO USE EITHER OF THESE METHODS, THE FOLLOWING RESTRICTIONS MUST BE MET.

a THE ADAPTER PLUS ANY EXTENSIONS TO BE USED BETWEEN THE WRENCH AND ADAPTER SHALL NOT EXCEED THE LENGTH OF THE WRENCH.

b WHEN A FORCE IS APPLIED AT 90 ± 3 DEGREES TO THE HANDLE OF THE WRENCH, IT IS RECOMMENDED THAT A STIRRUP TYPE HANDLE WITH A POINTER, INDICATING ANGLE OF LOADING, BE USED TO ENSURE LOADING AT THE CORRECT ANGLE.

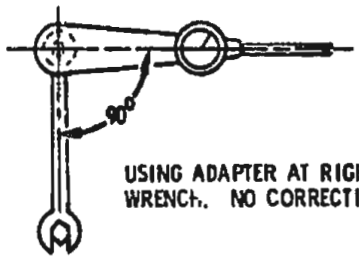
METHOD V



USING ADAPTER AT ANGLE OTHER THAN 90°. INDICATED TORQUE T_1:

$$T_1 = \frac{TA}{A+B}$$

METHOD VI



USING ADAPTER AT RIGHT ANGLE TO THE WRENCH. NO CORRECTION NECESSARY.

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R Torque Wrench Adapter
R Figure 201

WRENCH TORQUE IN POUND-INCHES FOR STRAIGHT SHANK STEEL BOLTS AND SCREWS (125,000 PSI TENSILE STRENGTH AND GREATER) WITH PLAIN, SELF LOCKING AND CASTELLATED NUTS			WRENCH TORQUE IN POUND-INCHES FOR BRASS AND ALUMINUM FASTENERS
BOLT OR SCREW SIZE	STANDARD OR TENSION NUTS	SHEAR NUTS	SHEAR NUTS
	FINE THREAD SERIES		FINE THREAD SERIES
NO. 10 - 32	25 - 30	10 - 12	10 - 15
1/4 - 28	60 - 65	20 - 25	20 - 32
5/16 - 24	110 - 125	40 - 50	40 - 60
3/8 - 24	185 - 205	70 - 80	70 - 100
7/16 - 20	300 - 330	110 - 125	110 - 165
1/2 - 20	465 - 510	175 - 190	175 - 255
9/16 - 18	675 - 735	255 - 275	
5/8 - 18	925 - 1000	345 - 375	
3/4 - 16	1560 - 1700	585 - 635	
7/8 - 14	2500 - 2700	935 - 1000	
1 - 12	3800 - 4100	1400 - 1500	
1-1/8 - 12	5400 - 5800	2000 - 2200	
1-1/4 - 12	7400 - 8100	2800 - 3000	
	COARSE THREAD SERIES		
NO. 8 - 32	12 - 15	7 - 9	
10 - 24	20 - 25	12 - 15	
1/4 - 20	40 - 50	25 - 30	
5/16 - 18	80 - 90	48 - 55	
3/8 - 16	160 - 185	95 - 110	
7/16 - 14	235 - 255	140 - 155	
1/2 - 13	400 - 480	240 - 290	
9/16 - 12	500 - 700	300 - 420	
5/8 - 11	700 - 900	420 - 540	
3/4 - 10	1150 - 1600	700 - 950	
7/8 - 9	2200 - 3000	1300 - 1800	
1 - 8	3700 - 5000	2200 - 3000	
1-1/8 - 8	5500 - 6500	3300 - 4000	
1-1/4 - 8	6500 - 8000	4000 - 5000	

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R
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Wrench Torque Values
Figure 202

R
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EFFECTIVITY: ALL

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LOCKING TORQUE - SELF-LOCKING NUTS					
THREAD SERIES					
	FINE			COURSE	
	TORQUE POUND-INCHES			TORQUE POUND-INCHES	
SIZE	*MINIMUM LOCKING	*MAXIMUM LOADING	SIZE	* MINIMUM LOCKING	*MAXIMUM LOCKING
4-48		3	4-40		3
			5-40	1.0	4
6-40	1.0	6	6-32	1.0	6
8-36	1.5	9	8-32	1.5	9
10-32	2.0	13	10-24	2.0	13
1/4-28	3.5	30	1/4-20	4.5	30
5/16-24	6.5	60	5/16-18	7.5	40
3/8-24	9.5	80	3/8-16	12.0	80
7/16-20	14.0	100	7/16-14	16.5	100
1/2-20	16.0	150	1/2-13	24.0	150
9/16-18	24.0	200	9/16-12	30.0	200
5/8-18	32.0	300	5/8-11	40.0	300
3/4-16	50.0	400	3/4-10	60.0	400
7/8-14	70.0	600	7/8-9	82.0	600
1-14	92.0	800	1-8	110.0	800
1-1/8-12	117.0	900	1-1/8-8	137.0	900
1-1/4-12	143.0	1000	1-1/4-8	165.0	1000

*THE MINIMUM TO MAXIMUM LOCKING TORQUE RANGE IS USED FOR DETERMINING THE USABILITY OR REUSABILITY OF A NUT (SELF-LOCKING AND BOLT COMBINATIONS. LOCKING TORQUE IS THE TORQUE REQUIRED TO START THE NUT TURNING, WHEN:

(a) THE NUT IS ENGAGED WITH AT LEAST TWO FULL BOLT THREADS EXTENDING BEYOND THE LOCKING DEVICE OF THE NUT.

(b) THERE IS NO AXIAL LOAD ON THE NUT.

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R Locking Torque Values For Self-Locking Nuts
R Figure 203

TORQUE FOR REDUCED HEAD BOLTS

BOLT SIZE	TORQUE RANGE POUND-INCHES
8-32	10-13
10-32	15-18
1/4-28	26-30
5/16-24	60-65
3/8-24	95-105

STANDARD TORQUE VALUES FOR RIGID TUBE COUPLING CONNECTOR

TUBE OD INCHES	ALUMINUM ALLOY FITTINGS NAS591-599 TORQUE POUND-INCHES		STAINLESS STEEL FITTINGS NAS594-596 TORQUE POUND-INCHESS	
	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM
1	480	720	480	720
1-1/4	600	900	600	900
1-1/2	600	900	600	900
2	900	1200	900	1200
2-1/2	1500	1800	1800	2100
3			1800	2100
4			2400	2700

STANDARD TORQUE VALUES FOR PIPE THREAD FITTINGS

PIPE THREAD SIZE INCHES	ALL PIPE EXCEPT STAINLESS STEEL TO STAINLESS STEEL		STAINLESS STEEL TO STAINLESS STEEL PIPE FITTINGS	
	WORKING TORQUE POUND-INCHES	MAXIMUM TORQUE POUND-INCHES	TORQUE POUND-INCHES	
			MIN	MAX
1/8	100	175		
1/4	150	300		
3/8	225	450		
1/2			100	500
3/4			150	600
1			200	800

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R Standard Torque Values For Reduced Head Bolts, Rigid Tube Coupling
R Connector and Pipe Thread Fittings
R Figure 204

R EFFECTIVITY: ALL
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TUBING OD INCH	FITTING NUT SIZE	TORQUE *(1) POUND-INCHES	TORQUE *(2) POUND-INCHES
1/4	-4	110	[illegible]
5/16	-5	140	[illegible]
3/8	-6	170	[illegible]
1/2	-8	280	[illegible]
5/8	-10	360	[illegible]
3/4	-12	450	[illegible]
1	-16	750	[illegible]
1-1/4	-20	900	[illegible]
1-1/2	-24	900	[illegible]
2	-32		[illegible]

*(1) TORQUE VALUES ARE APPLICABLE TO:

(1) FLARED ALUMINUM TUBE ENDS
(2) FLARELESS TYPE HOSE END FITTINGS WITH ALUMINUM INSERTS
(3) STANDARD MS FLARELESS TUBE ENDS ON 6061T6 ALUMINUM TUBING AND ANNEALED CRES TUBING. ANNEALED CRES TUBING IS IDENTIFIED BY A WIDE YELLOW BAND ADJACENT TO TUBING USE IDENTIFICATION CODE MARKINGS

*(2) TORQUE VALUES APPLICABLE TO FLARED HOSE END FITTINGS WITH ALUMINUM INSERTS

NOTE:

TORQUE VALUES ARE APPLICABLE TO ALL WALL THICKNESSES FOR A GIVEN DIAMETER TUBING AND HAVE A ± 5 PERCENT TOLERANCE.

[illegible]

R Standard Torque Values For Low Pressure and Return Line Fittings
R Figure 205

TUBING OD (INCH)	FITTING NUT SIZE	TORQUE * (1) POUND-INCHES
3/16	-3	100
1/4	-4	140
5/16	-5	190
3/8	-6	270
1/2	-8	500
5/8	-10	700
3/4	-12	900
1	-16	1200
1-1/4	-20	1600
1-1/2	-24	2000
2	-32	2600

* (1) TORQUE VALUES ARE APPLICABLE TO:

(1) FLARED FITTINGS ON 1/8 HARD (MIL-T-6845) OR ANNEALED CRES (MIL-T-8504 OR MIL-T-8808) TUBING
(2) FLARED AND FLARELESS TYPE HOSE END FITTINGS WITH STEEL INSERTS
(3) STANDARD MS FLARELESS TUBE END ON MIL-T-6845 TUBING

NOTE:

TORQUE VALUES ARE APPLICABLE TO ALL WALL THICKNESSES FOR A GIVEN DIAMETER TUBING AND HAVE A ± 5 PERCENT TOLERANCE

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R Standard Torque Values For High Pressure Line Fittings
R Figure 206

R EFFECTIVITY: ALL
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V-BAND CLAMP	TORQUE POUND-INCHES
DUCT O.D. (INCHES)	
1.00-1.75 2.00-2.75 [illegible] 5.00-6.00 8.00-10.00	40 45 [illegible] 55 60

CHANNEL BAND CLAMP	TORQUE POUND-INCHES
DUCT O.D. (INCHES)	
1.00-7.55	35

DUCT SUPPORT CLAMP	TORQUE POUND-INCHES
DUCT O.D. (INCHES)	
2.00-8.00	20-25 10-15 • ⚠1

HOSE CLAMP	TORQUE POUND-INCHES
HOSE O.D. (INCHES)	
1.75-20.00	20

• ⚠1 ON TITANIUM DUCTS, 0.016 THICKNESS WITHOUT SUPPORT BANDS, THE INSTALLATION TORQUE RANGE SHALL BE 10 TO 15 POUND-INCHES OR 10 POUND-INCHES OVER THE NUT THREADING TORQUE, WHICHEVER IS GREATER.

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R R Standard Torque Values For Clamps
Figure 207

R EFFECTIVITY: ALL
R R
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R PREPARATION FOR AND INSTALLATION OF
R MECHANICAL FASTENERS

R 1. General

R This section establishes standard practices for preparation and
R installation of mechanical fasteners.

R A. Reference Index

R Paragraph	Subject
R 4.A.	Hole preparation
R 4.B.	Riveting
R 4.C.	Bolts, screw and nuts
R 4.D.	Gaps and flushness
R 4.E.	Shimming of gaps
R 4.F.	Wire stitching
R 4.G.	Dimpling

R 2. Referenced Procedures

R 20-51-15 Application of Adhesives - Maintenance Practices

R ANSI B46.1 Surface Texture

R MIL-H-6088 Heat Treatment of Aluminum Alloys

R 3. Equipment and Materials

R Wire, Carbon Steel, Bookbinder: Open Vendor; Fed Spec QQ-W-414;
R or equivalent

R Sandwich Panel, Aluminum Compressed Honeycomb Foil: Panel-Air
R Corp., (FSCM 31967), P/N Panelam A.091; Lockheed P/N LCM28-1033B
R Type II; or equivalent

R Compound, Sealing, Integral Fuel Tanks: Product Research Co.,
R (FSCM 83574), P/N PR7401; Lockheed P/N LCM40-2180; or equivalent

R Lubricant, Machining: Orelube Corp., (FSCM 18554), P/N Boelube
R 100A; Lockheed P/N L34.8004; or equivalent

R Lubricant, Hole Drilling: Tec Chemical Co., P/N Tec-2032;
R Lockheed P/N L34.8022; or equivalent

R Cheesecloth: Open Vendor; Fed Spec DDD-C-301; or equivalent

R Naptha, Aliphatic: Open Vendor; Fed Spec TT-N-95; or equivalent

R Deburring Tool: Lockheed, (FSCM 36659), P/N L211F23-1; or
R equivalent

R Deburring Tool: Lockheed, (FSCM 36659), P/N L211C41-C; or
R equivalent

R Stapel, Duo-Fasc: Duo-Fast Corp. (FSCM 04206)

R 4. Preparation For and Installation of Mechanical Fasteners

R A. Hole Preparation

R (1) When fasteners are installed through faying surface
R sealant or installed wet, holes will be prepared using
R machining lubricant or hole drilling lubricant,
R reference Equipment and Materials.

R NOTE: Holes prepared in parts which can be cleaned
R prior to assembly are not subject to this
R lubricant restriction.

R (a) When hole drilling lubricant is used for preparing
R holes in which fasteners are installed with
R sealant (wet), lubricant will be removed from
R surface of countersunk portion of hole prior to
R installation of fastener.

R WARNING: USE NAPTHA IN WELL-VENTILATED AREA. DO NOT
R INHALE VAPOR, AND AVOID FLUID CONTACT WITH
R SKIN AND EYES. PROLONGED EXPOSURE MAY RESULT
R IN NAUSEA OR SKIN OR EYE IRRITATION.

R (b) When machining lubricant is used in preparing
R holes, all excess lubricant must be wiped off
R after drilling, using a cheese cloth dampened with
R naptha.

R (2) Punching Fastener Holes

R CAUTION: PUNCHING OF HOLES TO FINAL SIZE FOR RIVETS,
R BOLTS OR SCREWS IS NOT PERMITTED.

R (a) Pilot holes may be punched.

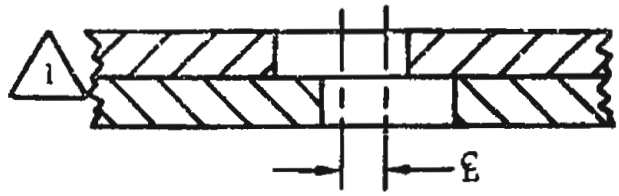
R CAUTION: BEFORE FINAL DRILLING OR REAMING TO SIZE,
R MAXIMUM PERMISSIBLE MISALIGNMENT OF
R CENTERLINES OF MATCHING HOLES, MUST CONFORM
R TO TABLE 201.

(b) Drill or ream to final size, with minimum cleanup on diameter conforming to Table 201.

MATERIAL		DIMENSION IN INCHES		
		THICKNESS	MINIMUM CLEANUP ON DIA.	MATCHING HOLE MISALIGNMENT (1)
ALUMINUM	SHEET	0.025-0.125	0.015	0.003 MAX (2)
	EXTRUSIONS	0.094 MAX	0.054	
TITANIUM	SHEET	0.025-0.063	0.015	
STEEL		0.064-0.093	0.025	
NICKEL BASE	EXTRUSIONS	NOT PERMITTED		

NOTES:

(1)



MISALIGNMENT OF PUNCHED HOLES BEFORE CLEANUP

(2) 10% OF HOLES IN A GIVEN LINEAR PATTERN MAY EXCEED THIS VALUE BY 100% UNDER FOLLOWING CONDITIONS:

(A) NOT PERMITTED FOR TWO ADJACENT HOLES.
(B) NOT MORE THAN ONE HOLE IN ANY GROUP OF TEN.
(C) NOT PERMITTED IN THE THREE END HOLES IN ANY GIVEN PATTERN

(c) Elongated fastener holes may be punched full size in parts which require linear movement for adjustment.

(3) Electrical Discharge Machined (E.D.M.) holes must have .020 inch removed from hole diameter by chip removal method.

(4) Hole sizes for all upsettable solid rivets must conform to Table 202.

NOTE: If a solid rivet must be replaced, hole sizes in Table 202, labeled "Permissible Hole Size For Reinstalled Rivets" will apply.

Hole Diameter for Upsettable Rivets (inches)
Table 202

RIVET DIAMETER	HOLE SIZE		PERMISSIBLE HOLE SIZE FOR REINSTALLED RIVETS[1] (MAXIMUM)
	TYPE E (7050) RIVETS	ALL OTHERS	
1/16		.067 - .072	.074
3/32		.097 - .102	.106
1/8		.128 - .134	.140
5/32		.159 - .165	.174
3/16	.192 - .196	.191 - .196	.209[2]
1/4		.256 - .263	.276
5/16		.322 - .329	.342

NOTE: [1] Allowable on a maximum of 10% of the rivet pattern providing that no more than two holes to these values are adjacent.

[2] .200 maximum for type E (6050) rivet.

(5) Rivet holes will have a surface finish of 125 Roughness Height Rating (microinches) titanium alloys and 250 RHR (microinches) or better in other alloys when measured in accordance with American National Standard Institute (ANSI) B46.1.

(6) Deburring fastener holes.

(a) Fastener holes in aluminum alloys:

- When automatic riveting or semi-automatic drilling equipment is used, deburring is not required.
- When parts are clamped tightly together deburring is not required.
- Under all other conditions, deburring to remove protruding burrs is required.
- Avoid countersinking of hole when deburring.

• Deburring method which flat faces hole is preferred.

• Deburring tool L211F23-1 for hole entrance side and tool L211C41-C for inaccessible area (exit side) may be used for deburring.

(b) Fastener holes in steel alloys:

• Deburr to configurations shown in Table 203.

(c) Fastener holes in titanium alloys:

• Drilled holes will be deburred to configurations shown in Table 203.

• Drilled holes which are expanded to final size in automatic riveting operation do not require deburring on exit side (rivet upset side) and between sheets (faying surfaces).

(7) Surface Countersinking

CAUTION: DO NOT SUBSTITUE DIMPLING FOR COUNTERSINKING UNLESS SPECIFICALLY CALLED OUT BY ENGINEERING.

DO NOT PRODUCE SHOULDERED COUNTERSINKS TO ACCOMMODATE LANDS ON FASTENER HEADS, REFERENCE FIGURE 201.

(a) Countersink diameter sufficient tc meet applicable flushness requirements for three-thirty seconds of an inch diameter rivets, used for attachment of nut plates, gang channel or similar type items, a minimum sheet thickness of .025 inch can be countersunk.

(8) Sub-Countersinking

WARNING: WHERE SUB-COUNTERSINKING IS USED FOR MATING A COIN DIMPLED SURFACE SHEET WITH ITS CORRESPONDING SUBSTRUCTURE, NOMINAL SUB-COUNTERSINK ANGLE WILL BE 100 DEGREES.

(a) Countersink diameter large enough to ensure fit with underside of dimple.

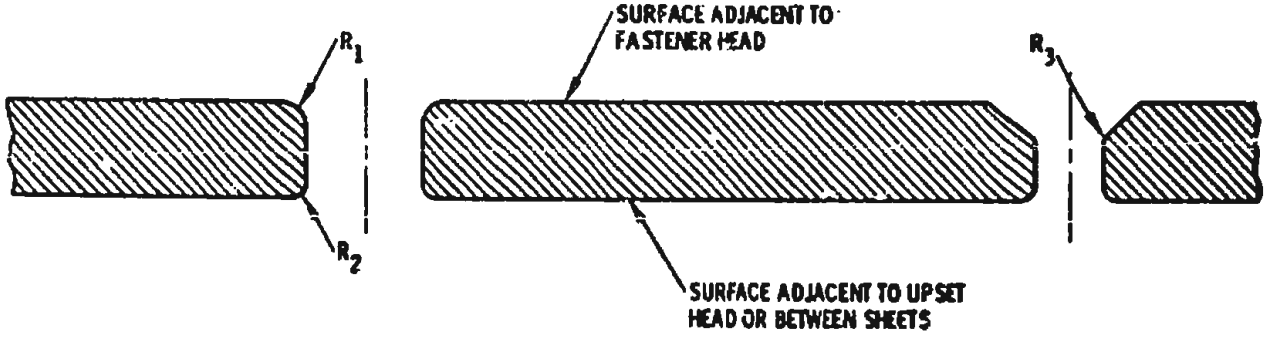
(b) When sub-countersink is used with conventional or large radius surface dimple (aged alloy), chamfer or radius top edge of countersink to provide clearence for correct fit as shown in Figure 201.

FASTENER DIAMETER	SHEET SURFACE ADJACENT TO FASTENER HEAD ⚠1		BETWEEN SHEETS AND SHEET SURFACE ADJACENT TO NUT OR UPSET HEAD, $R_2 \pm 0.008$	FLUSH HEAD, R_3
	CHAMFER ⚠2	RADIUS, R_1		
5/32 3/16 1/4	0.015 - 0.025	0.015 - 0.025	0.004	0.025 - 0.035
5/16 3/8 7/16 1/2			0.005	0.030 - 0.045
9/16 5/8 3/4	0.019 - 0.029 0.019 - 0.029 0.022 - 0.033	0.025 - 0.035 0.025 - 0.035 0.030 - 0.040	0.005 0.006 0.006	0.040 - 0.050 0.040 - 0.050 0.045 - 0.055

NOTE

⚠1 45° CHAMFER IS OPTIONAL TO THE RADIUS

⚠2 FOR SHEET THICKNESS 0.032 INCHES OR LESS, CHAMFER OR DEBURR ONLY AS TO PERMIT FASTENER SEATING



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Configuration of Fastener Holes in Steel and Titanium Alloys
Table 203

(c) Unless specified by engineering, the following restrictions will apply when sub-countersinking.

- The sum of sheet thicknesses will not be less than minimum total sub-sheet thicknesses listed in Table 204.
- The dimpled surface sheet will not be included in the sum of the thickness.
- Shim stock will not be included in the sum of the thickness.

NOTE: Any variations of values given in Table 204 will be as called out on engineering drawings when bonded or spot welded sheets are used, or where less aerodynamic resistance is required.

Sheet Thickness for Sub-Countersinking and Dimpling
Table 204

FASTENER		SUBCOUNTERSINKING	DIMPLING			
TYPE	SIZE (DIA.)	MINIMUM JOINT THICKNESS FOR SUBCOUNTERSINKING WHEN OUTER SHEET IS DIMPLED	CONVENTIONAL DIMPLING MAXIMUM	COIN DIMPLING		
				MINIMUM 1 OR 2 SHEETS	MAXIMUM 1 SHT	MAXIMUM 2 SHTS
Rivet	3/32	.050	.040	.020	.050	.063
	1/8	.063	.050	.020[1]	.063	.063
	5/32	.071	.063	.020	.071	.071
	3/16	.080	.071	.025	.071	.071
	1/4	.108	.063	.032	.071	.080
Screw	.1380	.076	.050	.020	.050	.063
	.1640	.084	.063	.020	.071	.071
	.1900	.095	.071	.032	.071	.071
	.2500	.121	.063	.032	.071	.080
	.3125	.147	----	----	----	----

NOTE: [1] For commercially pure annealed titanium, 0.016 minimum sheet thickness may be dimpled for 1/8 rivets.

B. Riveting

(1) Refer to Table 205 for rivet type and usage

Rivet Type and Usage
Table 205

RIVET ALLOY	TYPE	DIAMETER RANGE
1100 Aluminum	A	1/16 - 1/8
5056 Aluminum	B	3/32 - 3/16
2017 Aluminum	D	1/8 - 3/16
2117 Aluminum	AD	1/16 - 5/32
2024 Aluminum	DD	3/16 - 1/4
7050 Aluminum	E	3/16
A-286 CRES	---	1/8 - 3/16
Titanium (B120)	K	3/32 - 1/4
Monel	M	1/16 - 3/16

(2) Solid rivet nomenclatures are shown in Figure 202.

(3) Heat treatment of rivets

(a) Type D rivets 2017, and type AD rivets 2117, must be solution heat treated and aged a minimum of 96 hours at room temperature before use, except three-thirty seconds of an inch diameter type AD rivets 2117 only, which can be driven in "W" condition.

(b) Type DD rivets 2024, require heat treatment and refrigeration in accordance with MIL-H-6088. These rivets may be reheat treated to "W" condition.

NOTE: Do not allow refrigerated rivets to remain at room temperature longer than 15 minutes before being driven. However, it is advised that these rivets reach room temperature before upsetting.

(4) Substitution of Rivets

(a) Protruding head rivets one-eighth inch diameter can be substituted for three-thirty seconds of an

inch diameter protruding head rivets, providing a minimum edge distance of three-sixteenths of an inch is maintained.

(b) Substitution of three-thirty seconds of an inch and one-eighth of an inch diameter blind hollow rivets for solid rivets of equivalent diameter is permitted for attachment of 10-32 thread or smaller, two lug (opposite) nut plates, gang channel nuts, wood tack strips, and ground stud retainers. Following restrictions are applicable when substituting a blind rivet for a solid rivet.

- Completed rivets will be in an all pressurized area or an all unpressurized area and will not penetrate a pressurization barrier.
- Completed rivets will be in an all "wet" area or an all "dry" area and will not penetrate a fluid barrier. Same type rivet head will be used.
- Do not use blind hollow rivets to attach components listed above to material thinner than .040 inch.

Countersinking Configurations
Figure 201

- When aluminum alloy blind hollow rivets are specified, they will be made from 2117 aluminum alloy.

- Blind hollow rivets will be installed as shown in Figure 203.

(c) Type E (7050) rivets may be substituted for type DD (2024) rivets, providing they are not mixed within a joint pattern.

(5) Installation of Rivets

(a) Select rivets, except titanium rivets, in lengths which will produce upset dimensions conforming to Table 206.

Rivet Upset Dimensions, Except Titanium Rivets
Table 206

RIVET DIAMETER	FLAT UPSET			
	UPSET DIAMETER		UPSET HEIGHT	
	MAX	MIN	MAX	MIN
1/16		.078	.062	.031
13/32		.125	.062	.031
1/8		.172	.078	.047
5/32		3	.094	.062
3/16		.250[1,2]	.125	.078
1/4		.328	.156	.094
5/16		.406	.312	.125

Rivet Upset Dimensions, Except Titanium Rivets (Cont)
Table 206

RIVET DIAMETER	FLAT UPSET	
	UPSET DIAMETER	UPSET HEIGHT

NOTE: [1] For type D rivets (2017), the minimum upset diameter shall be 0.244 inch.

[2] For LS15838E6 rivets (7050), the minimum upset diameter shall be 0.280 inch.

[3] The maximum upset diameter is limited to the size which will meet height and quality requirements sepcified for driven rivets.

(b) Select titanium alloy rivets in shank lengths so that projection length does not exceed nominal rivet diameter plus .030 inch.

CAUTION: DO NOT USE KNURLED FLAT SETS TO UPSET TITANIUM RIVETS.

(c) Upset titanium rivets to dimensions shown in Table 207.

Titanium Rivet Upset Dimensions
Table 207

RIVET DIAMETER	FLAT UPSET			
	UPSET DIAMETER		UPSET HEIGHT	
	MAX	MIN	MAX	MIN
3/32	.14	.12	.06	.03
1/8	.17	.15	.07	.04
5/32	.22	.19	.09	.05
3/1	.27	.23	.11	.06

(d) During rivet installation in titanium structure, tightly clamp sheets close as possible to rivet being upset to prevent sheet or part separation.

NOTE: Titanium alloy rivets, except commercially pure, require high driving forces and driven heads are prone to crack.

(e) When protruding head rivets are required to be installed through outside surfaces, install manufactured head on exterior surface.

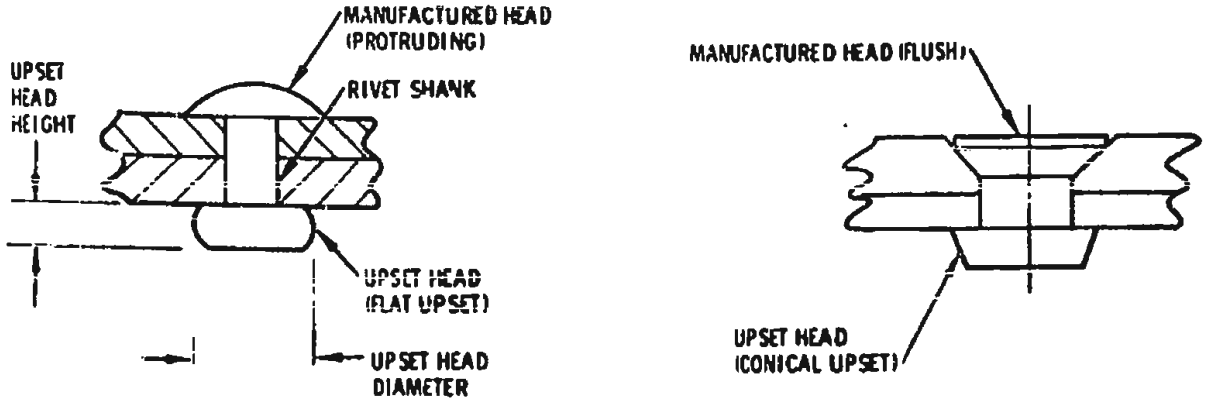
(f) Extra fine knurled flat sets with a pitch of 40 to 89 knurls per inch can be used to upset rivets other than titanium.

(g) The surface finish of flat sets will not exceed 250 Roughness Height Rating (microinches).

(h) Rivets may be upset on surfaces sloped up to seven degrees from axis of rivet hole.

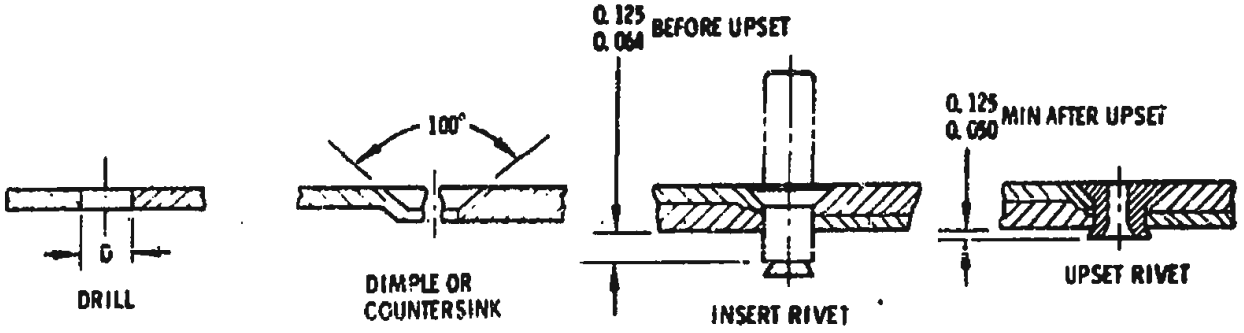
(i) Solid rivets, as shown in Figure 202, will be installed with squeeze type equipment or with multiple blow hand operated tooling (rivet gun and bucking bar).

(j) Single impact tooling or installation methods are prohibited for solid rivets except that Hi-Lok and

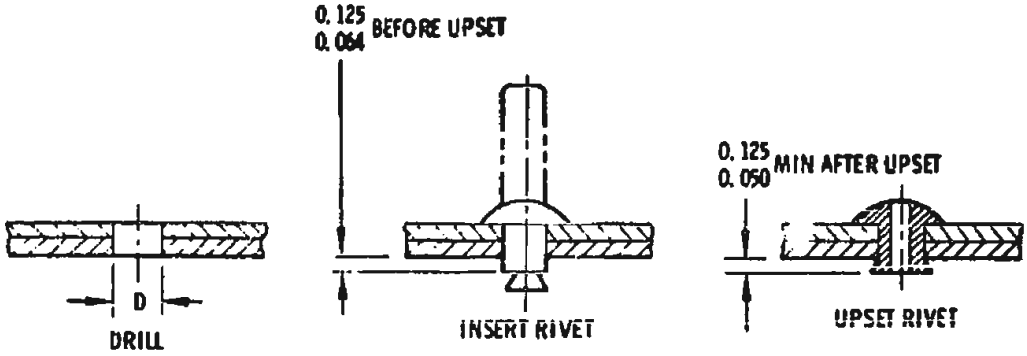


M1-0009-20-839

Solid Rivet Nomenclature
Figure 202



FLUSH HEAD (MS20605)



UNIVERSAL HEAD (MS20604)

NOMINAL DIAMETER	D DIAMETER
3/32	0.097 0.101
1/8	0.128 0.132
5/32	0.160 0.164
3/16	0.192 0.196

NOTE:

1 SHEETS TO BE RIVETED SHALL BE HELD TOGETHER TIGHTLY.

2 UNLESS OTHERWISE NOTED FLUSHNESS REQUIREMENTS FOR FLUSH RIVETS SHALL BE THE SAME AS FOR SOLID RIVETS AS SHOWN BY APPLICABLE SPECIFICATION

M1-0000-20-840

Installation Requirements of Blind Hollow Rivets
Figure 203

Hi-Tique pins may be installed with single impact pin drivers.

(k) Countersink diameters A and B (Ref. Fig. 204) will be equal for both manufactured head and upset head when countersink angle is 100 degrees.

(l) Do not upset titanium and steel upsettable rivets into a countersunk hole.

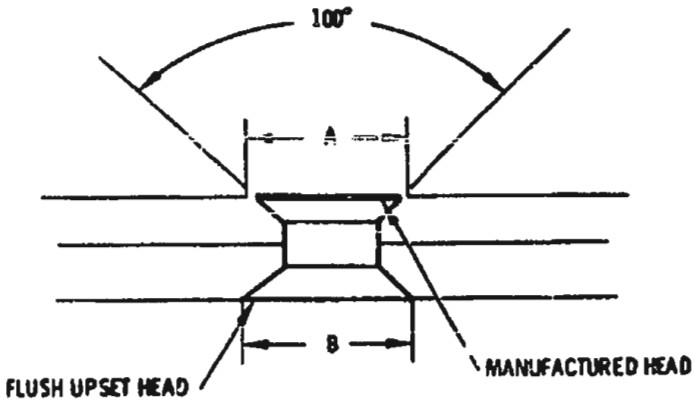
(m) Use next size smaller universal head riveting die when forming protruding or universal head upsets.

NOTE: Upset dimensions will be the same as those specified for flat upsets in Table 206, for corresponding rivet diameter.

(n) Do not upset aluminum alloy rivets by spinning unless authorized by engineering.

NOTE: When authorized, upset dimensions will be as specified in Figure 205.

(o) Do not upset titanium and steel rivets by spinning.



M1-0001-20-613

Double Flush Rivet
Figure 204

(p) Install tubular rivets with head against soft material and project through material .047 to .078 of an inch.

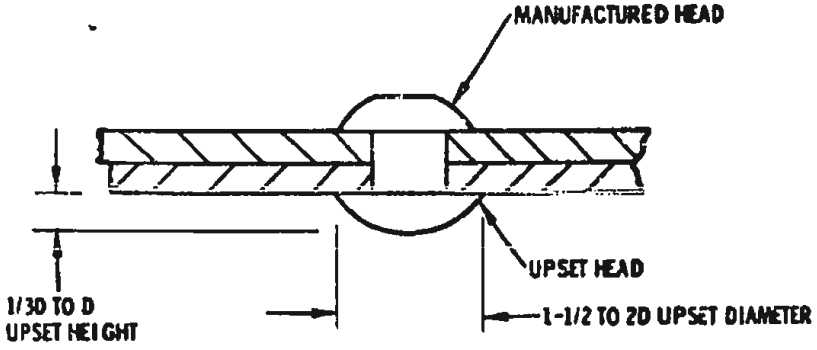
(q) Upset tubular rivets using a special set which curls the point rather than flattening or splitting it.

(r) Swell point of tubular rivets sufficiently until rivet is tight in hole.

NOTE: The upset head does not need to curl back against the sheet (Ref. Fig. 206).

Hole size for tubular rivets will be the same as solid rivets (Ref. Table 202).

(s) When installing fasteners which are subsequently upset or driven into an interference fit hole, in integrally stiffened material, constrained extrusions or other machined parts, apply installation force so that the fillet areas are not placed in a tension load which could cause cracking (Ref. Fig. 207).



M1-0001-20-614

Spun Rivet Upset Dimension
Figure 205

(t) In thin wall tubing used for control rods, actuating rods, etc. where fasteners are loaded in shear only, it is permissible to have a gap under each side of the head where the flat portion of the fastener head does not conform to the round shape of tubing, these gaps will be approximately equal.

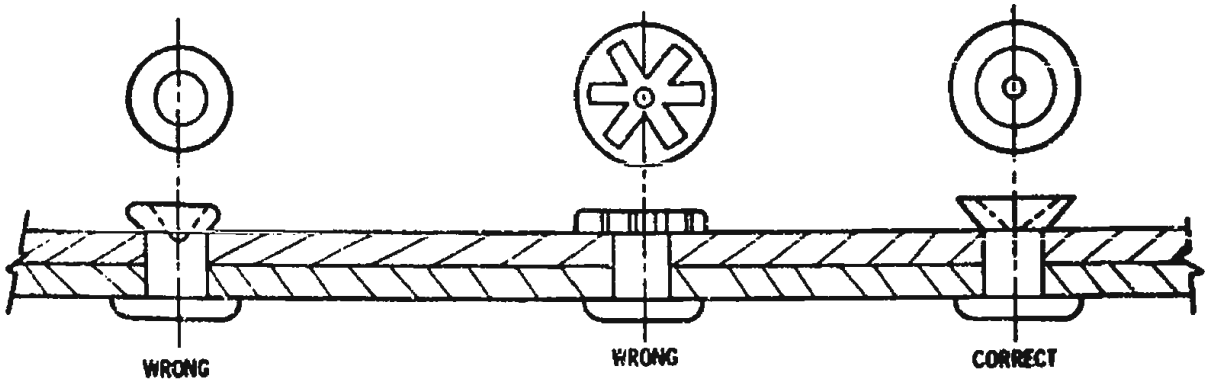
(u) No gaps are acceptable at points of tangency with fasteners and tubing (Ref. Fig. 208).

(v) Remove all traces of temporary protective coatings before installing a rivet.

NOTE: Any protective coating remaining under rivet heads will not be acceptable.

(w) Install a .016 to .032 thick aluminum alloy washer between the rivet upset head and material when installing rivets in glass fabric laminates and similar plastic materials.

(6) Rivet Edge Distances



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Tubular Rivets
Figure 206

(a) When riveting nut plates to material .040 inch and thicker, minimum edge distance will be equal to one rivet diameter.

(b) When riveting nut plates to material .040 inch and less, minimum edge distance will be equal to 1-1/2 times rivet diameter.

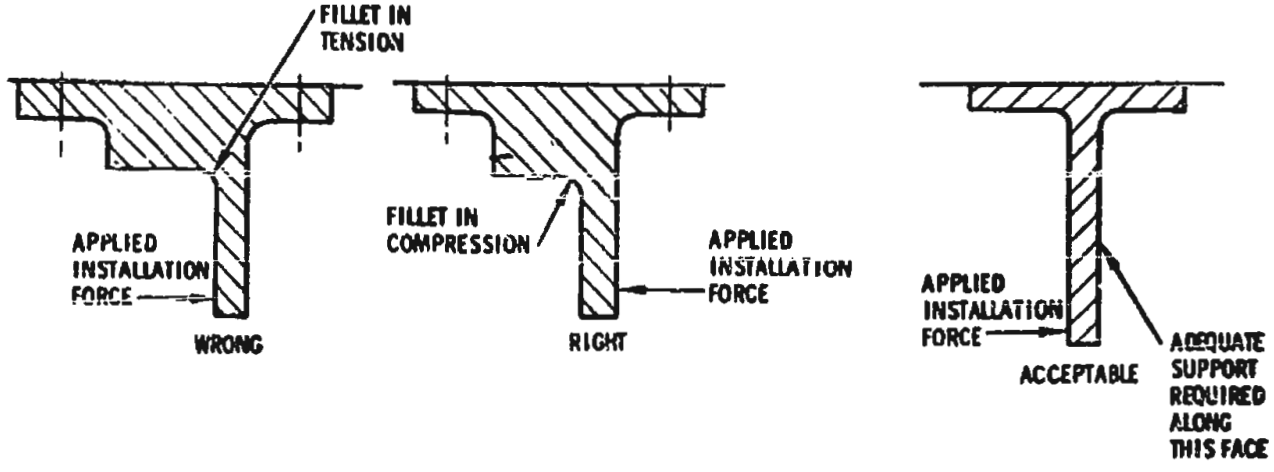
NOTE: When required for clearance, portions of nut plates overhanging material may be removed.

(7) Rivet Quality Requirements for Manufactured Heads

(a) Profile changes on a manufactured head of protruding head rivets caused by metal flow around approved rivet sets or for other reasons will not be cause for rejection.

NOTE: Profile changes do not include cuts, feathered edges or other examples of poor workmanship.

(b) Do not drive a rivet with a set that is too large, damage to sheet surface can result (Ref. Fig. 209).



M1-0001-20-616

Riveting Integrally Stiffened Material
Figure 207

(c) Do not drive a rivet with a set which is too small, a lap or crack may be formed at junction of head or shank in addition to a complete circle being indented in manufactured head of rivet (Ref. Fig. 209).

(d) Flat sets may be used on MS20470 universal head rivets on interior surfaces provided that manufactured head height after driving is equal to or greater than one-third of rivet shank diameter.

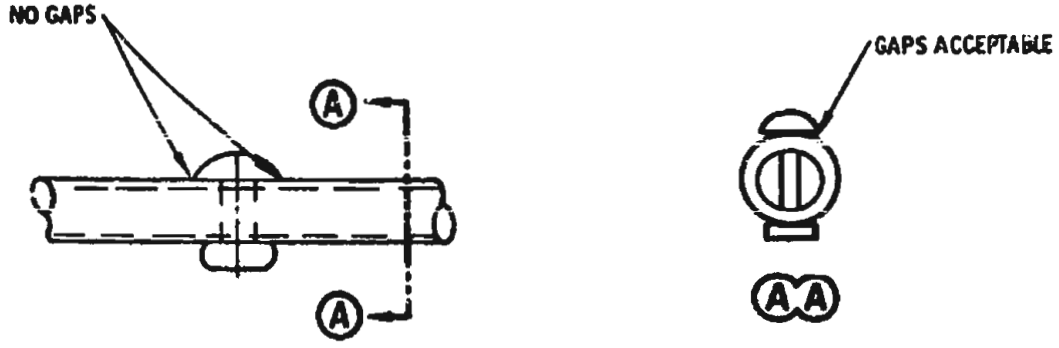
(8) Rivet Quality Requirements for Upset Heads

(a) Out-of-round heads will be in accordance with minimum diameter requirements in Table 206 or 207.

(b) Accept tipped or angled heads if minimum upset height is not less than minimum allowable in Table 206 or 207.

(c) Accept cut heads caused by slipping of bucking bar or other reasons if depth of cut does not exceed .002 inch.

(d) Heads with more than one cut as shown in Figure 210 will be removed and replaced.



M1-0000-20-661

Rivets in Thin Wall Tubing
Figure 208

NOTE: Cut heads are unacceptable in A-286, monel and titanium rivets.

(e) Clinched, offset or eccentric upset heads will be rejected if hole or hole deburring chamfer is visible (Ref. Fig. 210).

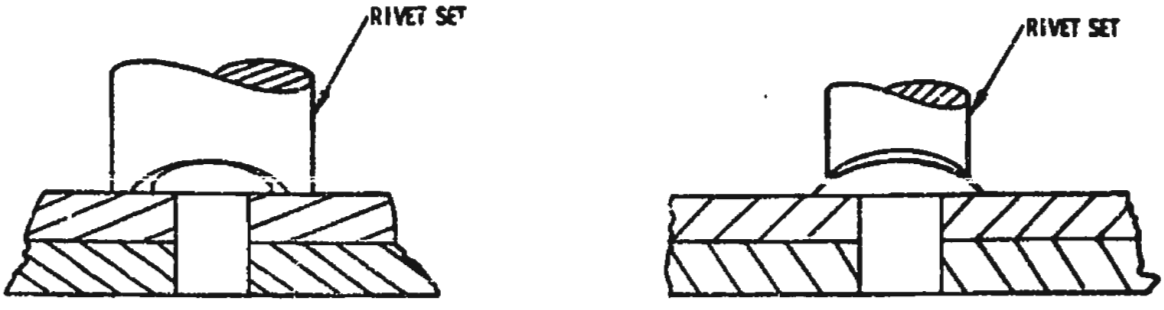
(f) Rivets with burst cracks will be removed and replaced (Ref. Fig. 210).

NOTE: Burst cracks are usually caused by incorrect heat treatment, rather than upsetting methods.

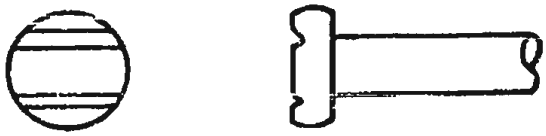
(g) Spiral cracks, up to three radial hairline and superficial cracks extending toward center of upset head, are acceptable in aluminum rivets, if cracks do not intersect (Ref. Fig. 210).

NOTE: No spiral racks are acceptable in A-286, monel or titanium rivets.

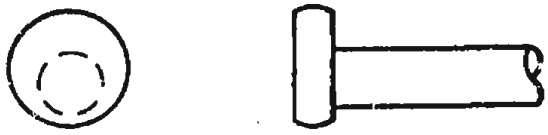
(h) Diagonal cracks in aluminum rivets which extend from top to bottom of head or intersect are unacceptable (Ref. Fig. 210).



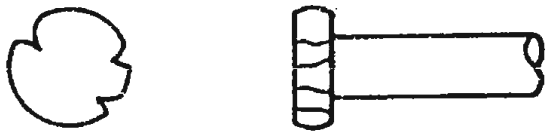
Unacceptable Rivet Sets
Figure 209



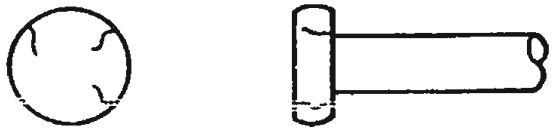
CUT UPSET HEAD



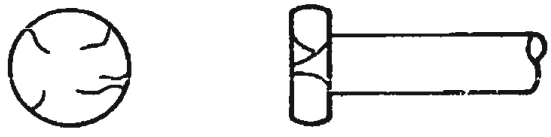
OFFSET OR ECCENTRIC HEAD



BURST CRACKS



SPIRAL CRACKS



DIAGONAL CRACKS

MI 3201-20-619

Defective Upset Heads
Figure 210

NOTE: No diagonal cracks are acceptable in A-286, monel or titanium rivets.

(i) Vertical cracks, in aluminum rivets, which are caused by laps in rivet wire are acceptable if cracks are smooth and dull in appearance and do not exceed .010 inch in depth.

NOTE: No vertical cracks are acceptable in A-286, monel or titanium rivets.

(9) Wet Installation of Fasteners

WARNING: USE COMPOUND IN WELL-VENTILATED AREA. DO NOT INHALE VAPOR AND AVOID MATERIAL CONTACT WITH SKIN AND EYES. PROLONGED EXPOSURE MAY RESULT IN LUNG, SKIN, OR EYE IRRITATION.

(a) For all types of permanent fasteners and their component parts which are wet installed, apply sufficient sealing compound to insure complete sealing of gaps between fastened structure or part and each fastener head, stem, sleeve collar, washer, nut, spacer and similar parts of fasteners.

NOTE: Do not use zinc chromate primer as a sealing compound unless specified by engineering.

(b) Apply sealing compound at a temperature range of 60 to 100 degrees Fahrenheit (15.5 to 37.7) degrees centigrade), and a relative humidity of 20 to 85 percent.

(c) Remove any sealing compound or primer which could prevent acceptable swaging of fastener locking collar from, protruding ends, locking grooves and pin-tails of locking bolts.

NOTE: Removal of sealing compound or primer will not be done until after installation of pin and prior to swaging of collar.

WARNING: USE COMPOUND IN WELL-VENTILATED AREA. DO NOT INHALE VAPOR AND AVOID MATERIAL CONTACT WITH SKIN AND EYES. PROLONGED EXPOSURE MAY RESULT IN LUNG, SKIN, OR EYE IRRITATION.

(d) Seal the fastener ends on the pressure side of self plugging blind rivets by brush coating with

sealing compound, Product Research Co. PR7401 or equivalent, after installation.

(e) Replace any sealing compound or primer removed from under rivet heads by applying appropriate sealing compound around rivet head and forcing it into voids or gaps, or removing rivet and correctly installing a replacement.

(10) Tack Riveting

(a) Tack rivets may be used instead of holding fixtures or to improve access.

NOTE: Do not use tack rivets in titanium structure, use threaded fasteners for holding titanium structure.

(b) Locate tack rivets on centerline of structural fastener.

(c) When a tack rivet cannot be removed or hole for final fastener cannot be drilled concentric with tack rivet hole, locate tack rivet as far as possible from structural fastener, in accordance with following limitations:

- Do not place tack rivets in a bend radius.
- Minimum tack rivet edge distance will be one and one-half times tack rivet diameter.
- Minimum tack rivet spacing will be one and one-half times structural fastener diameter.
- When installing tack rivets permanently in magnesium alloy parts, a type B, 5056 aluminum rivet will be used.
- Tack rivets being installed on a flange adjacent to a structural rivet will be placed on a line drawn through structural rivet at an angle of 45 degrees from flange mold line, or in a position which does not reduce cross sectional area of flange.

(11) Blind Rivets

(a) Install self-plugging and hollow blind rivets in accordance with manufacturers instructions.

(b) Keep blind rivets in their original containers so that diameter and length may easily be checked and to prevent lubrication from evaporating and rivets from accumulating dust, dirt or grit.

NOTE: Excercise care to avoid loss of lubricant and accumulation of dust, dirt or grit, because blind rivets cannot be cleaned or relubricated.

C. Bolts, Screws and Nuts

(1) Install structural bolts and screws with heads up or in forward position, or in such a direction that loss of fastener will be less likely if nut is lost.

(2) Hole sizes for screws and bolts will be as specified on engineering drawing.

(3) Hole Finish

(a) Holes for bolts and screws in titanium alloy structure will have a finish of 125 Roughness Height Rating (RHR) (microinches) or better.

(b) Holes in structures other than titanium will have a finish of 250 RHR (microinches) or better.

(c) Do not punch bolt or screw holes to final size.

(d) Completely remove burrs and residual or hanging chips from hole and countersink areas.

(4) Bolt and Screw Length

(a) Substitution of a bolt or screw one size longer or shorter than that specified on engineering drawing is acceptable providing:

- They are Miscellaneous Small Parts (MSP), or free stock items.
- Controlled or special order bolts and screws are not readily available in next length sizes.
- Thread protrusion through nut meets requirements of Step 4C(7).
- No threads are in bearing unless sheet next to nut is over .094 inch thick.

- Threads in bearing do not exceed two threads, including thread run out, or 25 percent of sheet thickness, whichever is less.

- Special bolts and screws are not used on attachment joints for parts or assemblies which are required to be interchangeable.

(b) For threaded inserts, grip length of bolt will not interfere with threads of helical coil or threaded inserts for both blind and through hole inserts.

(5) Torque Requirments of Bolts, Screws and Nuts

NOTE: Unless otherwise specified by engineering, torque requirements will be as follows:

(a) Torque bolts, screws and nuts of 125,000 psi tensile strength or above to values in Table 208.

(b) When torque is applied to head side, torque bolt or screw to higher values listed in Table 208, within a tolerance of minus five percent to plus zero.

(c) Replace bolts screws or nuts torqued above values in Table 208.

(d) Torque bolts or screws installed through thin-walled tubing or joints containing non-metallic, non-resilient materials liable to be damaged or distorted by uncontrolled tightening of a fastener, only to the extent necessary to produce a secure joint without damage to or distortion of constituent parts.

NOTE: Within this limitation, any such bolt or screw may be torqued to applicable minimum torque value specified in Table 208.

(e) Torque bolts or screws through joints containing resilient materials, such as rubber, until material has been compressed approximately 25 percent of its original nominal thickness or until minimum torque values specified in Table 208 have been reached, whichever occurs first.

(f) Torque bolts and screws used to assemble parts requiring relative movement, to minimum torque values specified in Table 208.

NOTE: If function of assembly is restricted by use of this value, nut may be loosened to obtain freedom for acceptable function.

R Wrench Torque in Inch-Pounds for Straight Shank Bolts and Screws[1]
Table 208

BOLT OR SCREW SIZE	STANDARD OR TENSION NUTS		SHEAR NUTS	
	NORMAL VALUES[2]	ALTERNATE VALUES[2]	NORMAL VALUES[4]	ALTERNATE VALUES[3]
	FINE THREAD SERIES			
.1900 - 32	25 - 30	12 - 30	10 - 12	10 - 15
.2500 - 28	60 - 65	30 - 65	20 - 25	20 - 32
.3125 - 24	110 - 125	55 - 125	40 - 50	40 - 60
.3750 - 24	185 - 205	90 - 205	70 - 80	70 - 100
.4375 - 20	300 - 330	150 - 330	110 - 125	110 - 165
.5000 - 20	465 - 510	230 - 510	175 - 190	175 - 255
.5625 - 18	675 - 735	340 - 735	255 - 275	255 - 370
.6250 - 18	925 - 1000	460 - 1000	345 - 375	345 - 500
.7500 - 16	1560 - 1700	780 - 1700	585 - 635	585 - 850
.8750 - 14	2500 - 2700	1200 - 2700	935 - 1000	935 - 1350
R 1.0000 - 12	3800 - 4100	1900 - 4100	1400 - 1500	1400 - 2000
1.1250 - 12	5400 - 5800	2700 - 5800	2000 - 2200	2000 - 2900

R Wrench Torque in Inch-Pounds for Straight Shank Bolts and Screws[2] (Cont)
Table 208

BOLT OR SCREW SIZE	STANDARD OR TENSION NUTS		SHEAR NUTS	
	NORMAL VALUES[3]	ALTERNATE VALUES[3]	NORMAL VALUES[4]	ALTERNATE VALUES[3]
1.2500 - 12	7400 - 8100	3700 - 8100	2800 - 3000	2800 - 4000
	COARSE THREAD SERIES			
.1640 - 32	12-15[1]		7-9	
.1900 - 24	20-25		12-15	
.2500 - 20	40-50		25-30	
.3125 - 18	80-90		48-55	
.3750-16	160-185		95-110	
.4375 - 14	235-255		140-155	
.5000 - 13	400-480		240-290	
.5625 - 12	500-700		300-420	
.6250 - 11	500-700		420-540	
.7500 - 10	1,150-1,600		700-950	
1.0000 - 8	3,700-5,000		2,200-3,000	
1.1250 - 8	5,500-6,500		3,300-4,000	
1.2500 - 8	6,500-8,000		4,000-5,000	

R Wrench Torque in Inch-Pounds for Straight Shank Bolts and Screws[1] (Cont)
Table 208

BOLT OR SCREW SIZE	STANDARD OR TENSION NUTS		SHEAR NUTS	
	NORMAL VALUES[3]	ALTERNATE VALUES[3]	NORMAL VALUES[4]	ALTERNATE VALUES[3]

NOTE: [1] Use these values for LS15237-3XX screws.

The bolts, nuts, and screws listed in the following notes serve as examples only and are not intended to be all-inclusive of the types that must be torqued to the values of Table 208.

[2] Hex Head Bolts: LS15267, NAS428, NAS1096, NAS6103, NAS6203 thru 6220, NAS6303 thru 6320, NAS6403 thru 6420

Clevis Bolts: AN41 thru AN37

Eye Bolts: AN42 thru AN49

100° Head Bolts: LS15266, NAS1151 thru 1158, NAS1202 thru 1210, NAS4500 thru 4516, NAS4600 thru 4616

Pan Head Screws: LS15265, NAS600 thru 606, NAS5100 thru 5106, NAS5200 thru 5206

100 ° Head Screws: LS15264, NAS514, NAS5600 thru 5606, NAS5700 thru 5706, NAS5800 thru 5806

Flat Fillister Head: LS15263, NAS5300 thru 5306, NAS5400 thru 5406, NAS5500 thru 5506

[3] Tension Nuts

Plain Castellated: AN310[3]

Self-locking Castellated: RME9868[3]

Self-locking Hex: MS20500, MS21042, NAS679

Anchor: MS21051, MS21059, MS21075

12 Point: LH7559, LH7875

R Wrench Torque in Inch-Pounds for Straight Shank Bolts and Screws[2] (Cont)
Table 208

BOLT OR SCREW SIZE	STANDARD OR TENSION NUTS		SHEAR NUTS	
	NORMAL VALUES[3]	ALTERNATE VALUES[5]	NORMAL VALUES[4]	ALTERNATE VALUES[5]
	Barrel: NAS577			
	[4] Shear Nuts			
	Plain Castellated: AN320[5]			
	Self-locking Castellated: RMTE9868[5]			
	Plain Hex: AN315, AN316, MS35649, MS35650			
	Self-locking Hex: NAS1022			
	[5] For non-self locking nuts only, use alternate values or replace nut in those cases where alignment between bolt or screw cotter pin hole and nut slot is not reached using normal torque values.			
	Tension: AN310, RME9866			
	Shear: AN320, RMTE9868			

(g) Torque joints containing non-metallic materials such as wood, elastomers or plastics, to a value of no more than 80 percent of torque at which material begins to crush.

(h) On multiple bolt, screw or nut installations, following procedure for torqueing will apply:

- Finger tighten fasteners.
- Torque fasteners within correct limits.
- Fasteners in a group will be tightened in an order where extreme end fasteners are tightened first, followed by center fasteners and so on.

(i) When a specific torque is called out on engineering drawing, place a torque stripe so that it will indicate any alteration of applied torque through misalignment.

NOTE: Do not use torque stripe in fuel tank areas or on flush screw heads located on exterior surface of aircraft.

(6) Install fasteners as received with no additional lubrication, unless otherwise specified by engineering.

(7) Nuts

(a) Install nuts so not less than .030 inch of bolt or screw extends through nut, or when used with chamfered end bolts and screws, full chamfer must extend through nut.

(b) Screws and bolts available in .060 inch grip or length increments will not extend through nut more than .120 inch.

(c) Screws and bolts available in .120 inch grip or length increments will not extend through nut more than .190 inch.

(d) Screws and bolts which hold more than one wire harness clamp will not extend through nut more than .250 inch.

(e) Drilling or tapping of self-locking nuts is prohibited.

(f) Replace self-locking nuts when prevailing or running torque required to overcome locking device falls below that listed in Table 209.

Prevailing Torque for Self-Locking Nuts
Table 209

THREAD SIZE	INCH-LBS, MIN
.1900 - 32	2.0
.2500 - 28	3.5
.3125 - 24	6.5
.3750 - 24	9.5
.4375 - 20	14.0
.5000 - 20	18.0
.5625 - 18	24.0

Prevailing Torque for Self-Locking Nuts (Cont)
Table 209

THREAD SIZE	INCH-LBS, MIN
.6250 - 18	32.0
.7500 - 16	50.0
.8750 - 14	70.0
1.0000 - 12	90.0
1.1250 - 12	117.0
1.2500 - 12	143.0

(g) Do not use self-locking nuts with bolts drilled for cotter pins in sizes .250 inch and smaller.

NOTE: Substitution of self-locking nuts for castellated nuts is not permitted for any application.

(h) Gang channel nut sections may be cut to keep nuts aligned with bolt or screw holes.

(i) Do not, under any circumstances, rework sheet metal nuts or screws by filing, cutting or in any other manner.

(j) When using flat type nuts, a full bearing surface is required.

NOTE: "U" type nut may be used in place of flat type nut where edge distance will allow installation without additional rework.

(k) Use B or Z type sheet metal screws only with Z type sheet metal nuts, machine screws are not permitted.

(8) Washers

(a) Use of washers may be required to prevent thread from bottoming out against nut if bolts or screws one size longer than specified are used, reference Step 4C(4)(a).

(b) Washers may also be used to prevent dissimilar metal contact (Ref. Table 210).

Washer Selection for Bolts, Screws or Nuts
Table 210

MATERIAL ON WHICH WASHER RESTS	WASHER UNDER NUT OR UNDER BOLT HEAD	
Aluminum	AN960D	2024 A1
Steel	AN960	Carbon Steel
Magnesium	LS6061	505X A1
Titanium, Stainless Steel	AN960C	CRES
Wood, Plastic	AN970	Carbon Steel
In magnetic area (with brass nuts and screws)	AN960D	2024 A1

WASHER SELECTION FOR HIGH TENSION BOLTS	WASHER UNDER NUT		WASHER UNDER BOLT HEAD
MS21250	MS20002	Steel	MS20002 C Steel
68484, 68485, 70718V 76754	LS9851	Steel	LS9851-( )C Steel

(c) Do not use more than two washers on threaded end of fastener and not more than one washer under head of fastener.

(d) Use of a thin washer on a short bolt or screw is acceptable if washer does not tear or bend and requirements of Step 4c(4)(a) are satisifed.

D. Gaps and Flushness

(1) When one side of a protruding head fastener fails to contact surface, a maximum gap of .004 inch is permitted if number of fasteners affected does not exceed 10 percent of total and are not adjacent to each other (Ref. Fig. 211).

(2) When one side of an installed nut fails to contact bearing surface, a maximum gap is permitted as noted in Figure 211, if nuts affected do not exceed 10 percent of total and are not adjacent to each other.

(3) Aluminum, monel, titanium and A-286 upsettable rivets.

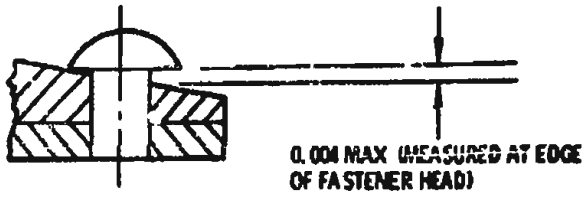
(a) When one side of rivet head fails to contact surface, resulting gap will not extend to rivet shank when checked with a .0015 inch feeler gage.

(b) Number of rivets with gaps will not exceed 10 percent of total and will not be adjacent to each other.

(c) Variation from preceding is permitted as follows:

• One-half of above rivets up to a maximum of five percent of total rivets will be permitted to have a gap in excess of 0015. inch, but will not permit a .0035 inch feeler gage to extend to rivet shank.

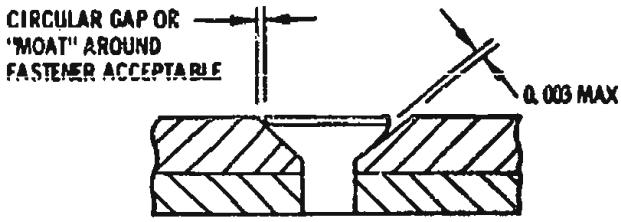
• These rivets will not be adjacent to any other rivet with a gap.



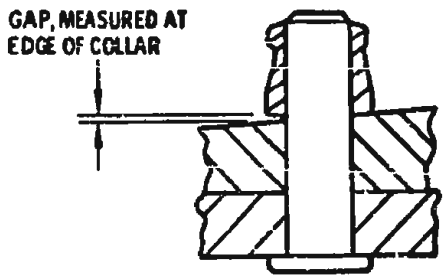
PROTRUDING HEAD FASTENER SEATING

THREAD SIZE	A (MAX)
UP THRU 7/16	0.004
1/2 THRU 5/8	0.005
3/4	0.006
7/8 AND ABOVE	0.007

NUT SEATING MAXIMUM GAP ALLOWANCE



FLUSH HEAD FASTENER SEATING



HI-LOK AND HI-TIQUE COLLAR SEATING

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Seating of Fasteners
Figure 211

(4) Gaps between flush head fasteners and countersink will not exceed .003 inch and will not extend for more than one-third of periphery (Ref. Fig. 211).

(5) Hi-Lok Hi-Tique Collar Seating

(a) No gaps are allowed under a head of an installed aluminum Hi-Lok or Hi-Tique collar up to seven-sixteenths of an inch nominal diameter.

(b) Hi-Lok or Hi-Tique aluminum collars one-half inch diameter or longer may have a .004 inch maximum gap at one point only (Ref. Fig. 211).

(c) Hi-Lok or Hi-Tique steel collars may have a .004 inch maximum gap at one point only (Ref. Fig. 211).

(6) Exterior surface gaps and flushness allowances for fasteners, permanent and service joints in wing, fuselage and stabilizer, will be as specified in each model Smoothness and Gaps drawing.

(7) Maximum gap allowed at edges of interior metallic parts after installation and take-up of fasteners, whether in a wet or dry joint, will be .010 inch as shown in Figure 212.

(8) Part Separation

(a) After fastener installation, maximum gap midway between fasteners through metallic parts, will be in accordance with Table 211.

Gaps After Fastener Installation
Table 211

THICKNESS OF THE THINNER MATERIAL BEING FASTENED (INCHES)	FAYING SURFACE SEALANT USED	MAXIMUM GAP MIDWAY BETWEEN FASTENERS (INCHES)
.020 - .049	Yes	.008
.050 - .079	Yes	.007
.080 and up	Yes	.006
.020 - .049	No	.006
.050 - .079	No	.004

Gaps After Fastener Installation (Cont)
Table 211

THICKNESS OR THE THINNER MATERIAL BEING FASTENED (INCHES)	FAYING SURFACE SEALANT USED	MAXIMUM GAP MIDWAY BETWEEN FASTENERS (INCHES)
.080 and up	No	.003

(b) At fastener shank, following will apply:

• Gaps will not extend to fastener shank when checked with a .0015 inch feeler gage, this may be increased to a .0035 inch feeler gage where faying surface sealant is required by engineering.

• Variation from above is permissible when checked with an additional .002 inch feeler gage on a maximum of five percent of fasteners, this increased gap allowance is not acceptable on more than two adjacent fasteners in a row of twenty consecutive fasteners.

• Do not deform or mar finish on parts when checking for gaps with a feeler gage.

• A gap "G" (Ref. Fig. 213) at fastener shank is permitted in transition area adjacent to intermediate material, this gap will not exceed .010 inch or "H" whichever is smaller, and will apply to not more than two rivets at each end of a rivet pattern.

(c) During assembly and before fastener installation, eliminate gaps anywhere between aluminum or titanium parts in a wet or dry joint either by pullup or by adding shims, reference Paragraph 4E.

• Amount of allowable pullup is controlled by configuration of parts, part thickness (T), and length (L), over which gap extends, examples of these conditions are shown in Figure 214 (Sheet 1) and (Sheet 2).

• When gap conditions shown in Figure 214 (Sheet 1) are between sheet metal parts, dimensions shown in Table 213 will apply. R

NOTE: Sheet metal parts are defined as parts having a constant section thickness equal

to or less than tabulated thickness range values in Table 213.

- If gap conditions in Figure 214 (Sheet 1) exist in other than sheet metal parts, such as extrusions, machined parts, forgings, castings, etc., then dimensions shown in Tables 214 and 215 will apply.

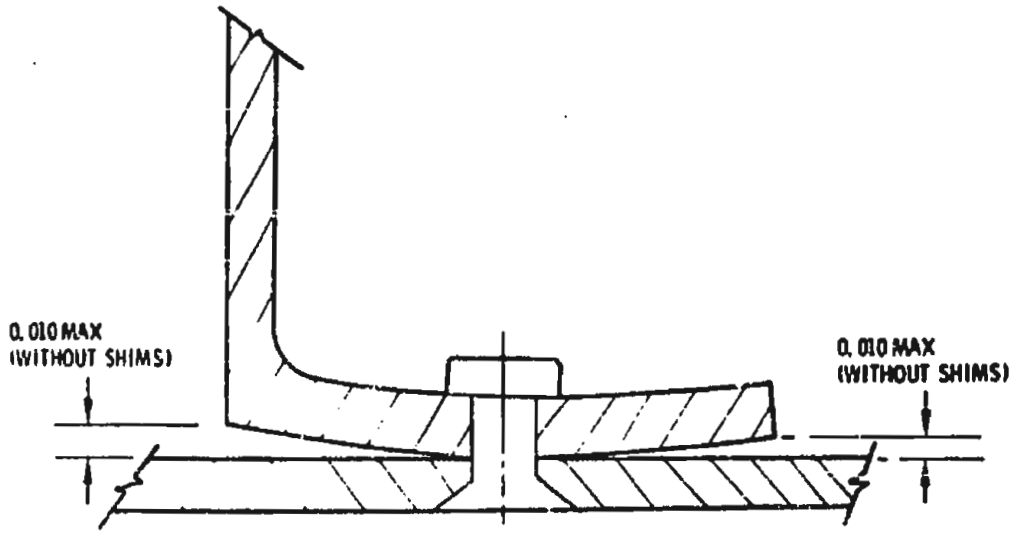
- When gap conditions in Figure 214 (Sheet 2) exist, then dimensions shown in Table 216 (Sheet 1) and (Sheet 2) will apply.

- Tables 213, 214, 215 and 216 (Sheet 1) and (Sheet 2) show relationship between length over which gap extends (L) and permissible amount of gap (G) which can be pulled up without adding shims.

- Measure gaps while applying manual pressure of not more than 15 pounds at intervals of 12 inches.

(9) Gaps under dimpled sheets will not exceed limits shown in Table 217.

(10) Exterior Surface Flushness



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Edge Gap Allowance
Figure 212

(a) Determine surface flushness by distance of fastener head above or below a point or points on skin surface, these points will be located a distance of one head diameter from center of fastener head.

(b) Measure above (plus) flushness at highest point on fastener head.

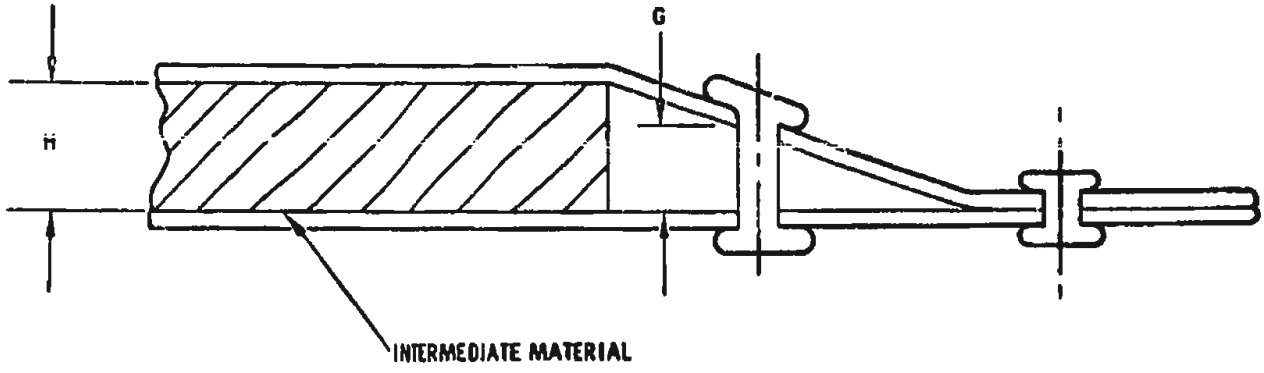
(c) Measure below (minus) flushness at lowest point on fastener head for all fasteners except crowned head upsettable rivets which will be measured at highest point on head.

(d) Crowned head upsettable rivets may be tipped a maximum of one degree provided all other flushness and gap requirements are met.

R (e) For flushness requirements (Ref. Table 218.

(11) Interior Surface Flushness

(a) Determine surface flushness in same manner as described in exterior surface flushness, Step 4D(12).



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Gap at Fastener Shank Adjacent to Intermediate Material
Figure 213

(b) Flushness requirements will be as follows:

- MS20426 rivets and similar type fasteners, plus .010 to minus .005 inch.
- Screws lockbolts, Jo-bolts, Hi-loks and similar type fasteners, plus .012 to minus .005 inch.
- NAS1097 rivets and similar type fasteners, plus .006 to minus .003 inch.

(12) Fastener Milling of Manufactured Head Only

(a) NAS1097 rivets will not be milled.

(b) One-sixteenth diameter rivets will not be milled.

(c) MS20426 aluminum alloy rivets, AN427M and MS20427 monel rivets and aluminum lockbolts may be milled to limits shown in Table 212.

R Flushness Limits for Milled Head Fasteners
R Table 212

RIVET DIAMETER	3/32	1/8	5/32	3/16	1/4
Maximum head protrusion prior to milling	.006	.007	.009	.010	.010
Minimum head diameter after milling	.161	.204	.263	.329	.443

(d) NAS1399, NAS1674 and NAS1739 blind rivets may be milled according to manufacturers instructions.

(e) LS10052 rivets may be milled in accordance with the following:

- Rivet must be five-thirty seconds inch diameter or larger.
- Maximum of five percent of rivet pattern may be milled and no more than two adjacent fasteners.

  Maximum of .005 inch may be removed from a rivet.
- Rivets which protrude less than .008 inch or more than .015 inch will not be milled.
- Do not contact adjacent clad skin material with rivet mill cutter.

E. Shimming of Gaps

(1) Shimming gaps in structural joints (Ref. Fig. 215).

(a) Shims in general areas will be no thicker than thinnest mating part.

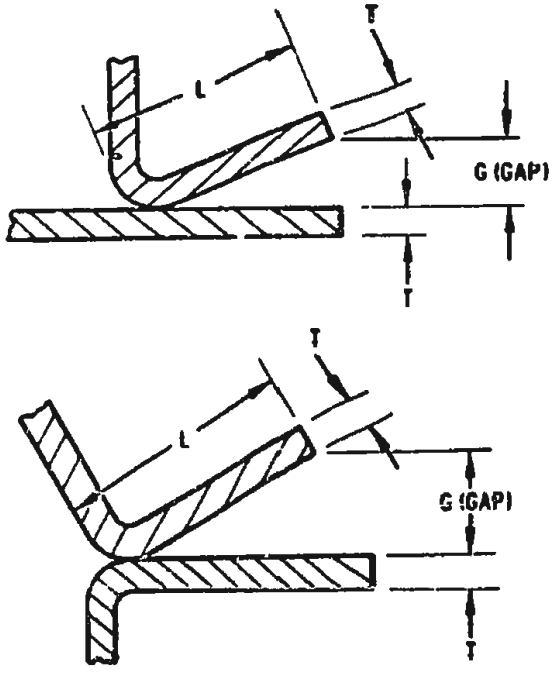
(b) Shims in "K" areas will be no thicker than 20 percent of thinnest mating part.

NOTE: "K" areas are known as specific structural zones which are considered more fatique susceptible than general areas. The following primary structural zones are identified as "K" areas: Structure carrying cabin pressure, including pressure decks, pressure bulkheads, and doors.

Forged and extruded rings (not formed sheet metal rings).

Stringers and longerons above W/L 256.

Doublers and framing members around openings, such as windows, windshields and doors.



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Gap Condition Before Fastener Installation
Figure 214 (Sheet 1)

Skins and splices on upper and lower surface of wings.

Wing beam caps and webs.

Rib caps carrying flap, landing gear, and pylon loadings.

Wing stringers.

Flap support fittings, flap end ribs and torque boxes.

Wing pylons and support structure.

Horizontal stabilizer integrally stiffened surfaces, upper and lower.

Horizontal stabilizer beam caps.

Horizontal stabilizer hinge support members.

Center engine support forging.

Main gear support structure, (rework of main gear parts requires stress approval).

Nose gear support structure, (rework of nose gear parts requires stress approval).

Bleed air ducting, including engine pylon ducting, both fuselage and wing, but not cabin distribution ducting.

(c) Either area will have no shim thicker than 15 percent of smallest fastener passing through shim.

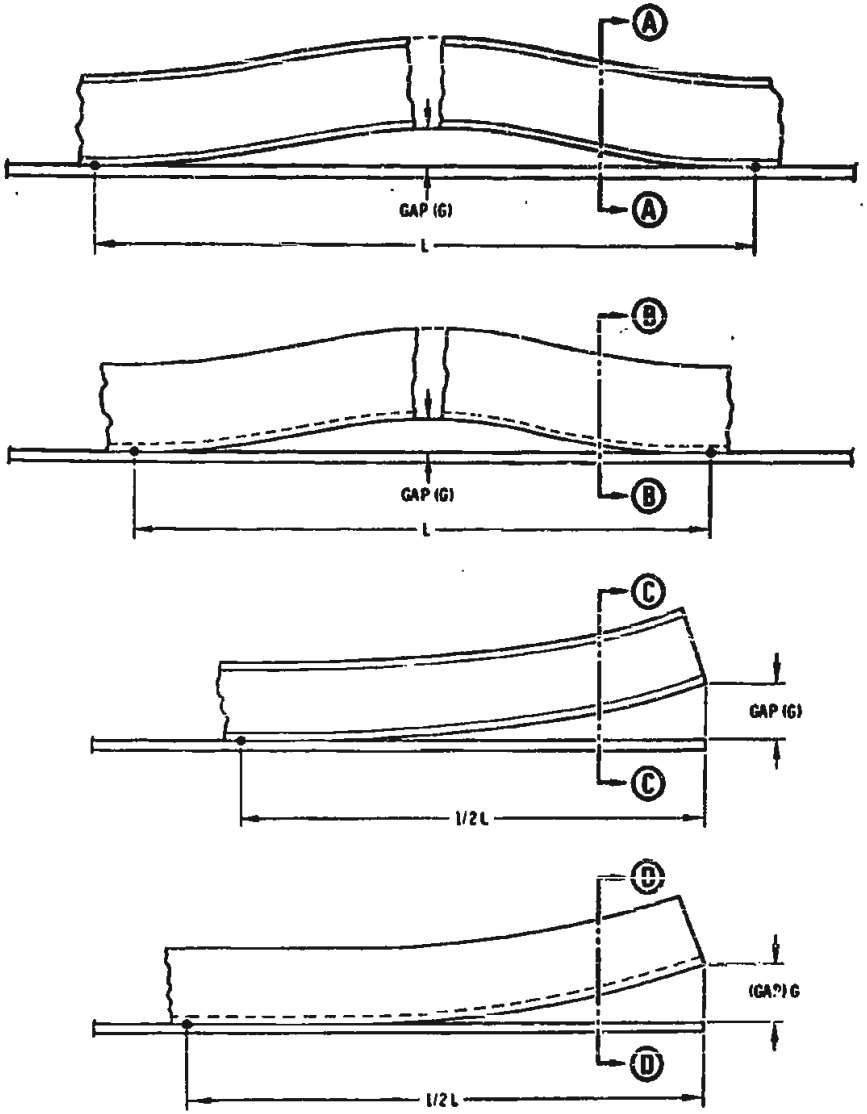
(d) Do not use a shim when interchangeability of shimmed parts or those adjacent are effected.

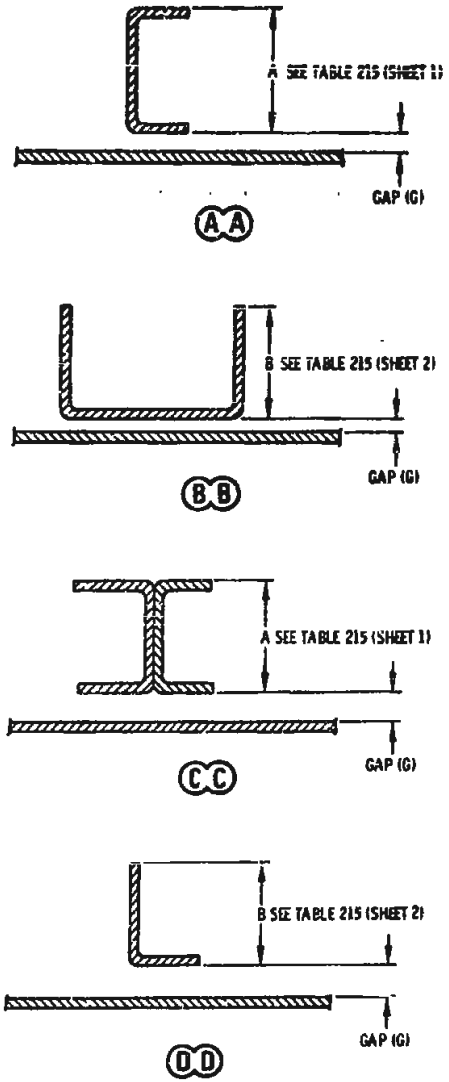
(e) Use one shim of 2024-T3 clad aluminum alloy for aluminum structure or one-fourth hard CRES for steel structure.

(f) Fabricate and install shim to fill gap between mating surfaces.

(g) Taper or contour shim as required.

(h) Flush one-sixteenth inch diameter tack rivets, two-diameters edge distance from all holes, or





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Gap Condition Before Fastener Installation
Figure 214 (Sheet 2)

bonding with metal to metal adhesive according to 20-51-15, Type 5, may be used to hold shim in place until assembly.

(i) Shim must pick up a minimum of two attaching fasteners.

(j) Shim must be permanently attached, as specified in rework instructions, at joints that may be opened in service.

(k) Spacing of added attachments and edge distance requirements must be maintained.

(2) Shimming Gaps Other Than at Joints

(a) Shims will be installed according to Type A, B, or C repair (Ref. Fig. 216) depending on thickness of shim as follows.

(b) In general areas:

• When shim thickness is up to same thickness as thinnest mating part, use Type A repair.

THICKNESS RANGE (T), ⚠1 INCHES	LENGTH (L), INCHES							
	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5
	MAX GAP (G), INCHES ⚠2							
0.025-0.034	0.04	0.08	0.15	0.24	0.34	0.46	0.50	0.50
0.035-0.044	0.03	0.07	0.12	0.18	0.26	0.36	0.47	0.50
0.045-0.054	0.03	0.06	0.10	0.15	0.22	0.29	0.38	0.48
0.055-0.064	0.02	0.04	0.08	0.13	0.18	0.25	0.32	0.41
0.065-0.074	0.02	0.04	0.07	0.11	0.16	0.22	0.28	0.35
0.075-0.099	0.02	0.03	0.05	0.08	0.12	0.16	0.21	0.26
0.100-0.119	-	0.02	0.04	0.07	0.10	0.13	0.18	0.22
0.120-0.150	-	0.02	0.04	0.06	0.08	0.10	0.14	0.16

NOTE:

⚠1 IN CASES OF UNEQUAL MATERIAL THICKNESS, (T) SHALL APPLY TO THE THINNEST GAGE

⚠2 IF THIS GAP IS 0.010 INCH OR LESS, SHIMMING IS NOT REQUIRED PROVIDED THE REQUIREMENTS OF STEP 3D (10) ARE SATISFIED

⚠3 INCLUDES PARTS MADE FROM EXTRUSIONS WITH A THICKNESS OF 0.09 INCH OR LESS WITH NO MACHINING OPERATIONS ON THE MATERIAL THICKNESS

M1-0002-20-634

Allowable Gap Pullup for Aluminum and Titanium Alloy Sheet Metal Parts
Table 213

R

- When shim thickness is up to 1-1/2 times thicker than thinnest mating part, use Type B repair.

- When shim thickness is up to two times thicker than thinnest mating part, use Type C repair.

(c) *In "K" areas:*

- When shim thickness is up to 40 percent thickness of thinnest mating part, use Type A repair.

- When shim thickness is up to 60 percent thickness of thinnest mating part, use Type B repair.

- When shim thickness is up to 80 percent thickness of thinnest mating part, use Type C repair.

(d) In either area:

- When shim thickness is up to 35 percent of diameter of smallest existing fastener passing through shim, use Type A repair.

THICKNESS RANGE (T), INCHES (1)	LENGTH (L), INCHES							
	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5
	MAX GAP (G), INCHES (2)							
0.025-0.034	0.01	0.02	0.04	0.06	0.09	0.12	0.15	0.19
0.035-0.044		0.02	0.03	0.05	0.07	0.09	0.12	0.15
0.045-0.054		0.01	0.02	0.04	0.05	0.07	0.10	0.12
0.055-0.064		0.01	0.02	0.03	0.05	0.06	0.08	0.10
0.065-0.074			0.02	0.03	0.04	0.05	0.07	0.09
0.075-0.099			0.01	0.02	0.03	0.04	0.05	0.07
0.100-0.119				0.02	0.02	0.03	0.04	0.06
0.120-0.150				0.01	0.02	0.03	0.04	0.05

NOTE:

(1) IN CASES OF UNEQUAL MATERIAL THICKNESS, (T) SHALL APPLY TO THE THINNEST GAGE

(2) IF THIS GAP IS 0.010 INCH OR LESS, SHIMMING IS NOT REQUIRED PROVIDED THE REQUIREMENTS OF STEP 3D (10) ARE SATISFIED

M1-0002-20-635

R Allowable Gap Pullup for Aluminum and Titanium Alloy of Uneqaul
R Thickness (Other Than Sheet Metal Parts)
Table 214

EFFECTIVITY: ALL

001B

• When shim thickness is up to 50 percent of diameter of smallest existing fastener passing through shim, use Type B repair.

• When shim thickness is up to 65 percent of diameter of smallest existing fastener passing through shim, use Type C repair.

(e) Do not use a shim when interchangeability of shimmed parts or those adjacent are effected.

(f) Use one shim of 2024-T3 clad aluminum alloy for aluminum structure or one-fourth hard CRES for steel structure.

(g) Fabricate and install shim to fill gap between mating surfaces.

(h) Taper or contour shim as required.

(i) Flush one-sixteenth inch diameter tack rivets, two-diameters edge distance from all holes, or bonding with metal to metal adhesive according to 20-51-15, Type 5, may be used to hold shim in place until assembly.

THICKNESS RANGE (T), INCHES	LENGTH (L), INCHES							
	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5
	MAX GAP (G), INCHES /1\							
0.025-0.034	0.02	0.04	0.08	0.12	0.17	0.23	0.30	0.39
0.035-0.044		0.03	0.06	0.09	0.13	0.18	0.24	0.30
0.045-0.054		0.03	0.05	0.08	0.11	0.15	0.19	0.24
0.055-0.064		0.02	0.04	0.06	0.09	0.12	0.16	0.20
0.065-0.074		0.02	0.03	0.05	0.08	0.11	0.14	0.17
0.075-0.099			0.03	0.04	0.06	0.08	0.10	0.13
0.100-0.119			0.02	0.03	0.05	0.07	0.09	0.11
0.120-0.150			0.02	0.03	0.04	0.06	0.07	0.09

NOTE:

/1\ IF THIS GAP IS 0.010 INCH OR LESS, SHIMMING IS NOT REQUIRED PROVIDED THE REQUIREMENTS OF STEP 3D.(10) ARE SATISFIED

M1-0000-20-842

Allowable Gap Pullup for Aluminum and Titanium Alloy Parts of Equal Thickness (Other Than Sheet Metal Parts)
Table 215

R
R

SECTION WIDTH (A), INCHES	LENGTH (L), INCHES													
	2.00	4.00	6.00	8.00	10.00	20.00	40.00	60.00	80.00	100.0	120.0	140.0	160.0	180.0
	MAX GAP (G), INCHES (3)													
0.025 TO 0.034	0.011	0.04	0.10	0.18	0.28									
0.035 TO 0.044		0.05	0.07	0.14	0.22									
0.045 TO 0.054		0.03	0.06	0.11	0.18									
0.055 TO 0.064		0.02	0.05	0.09	0.15									
0.065 TO 0.079		0.02	0.04	0.07	0.12	0.49								
0.080 TO 0.099		0.01	0.03	0.06	0.09	0.39								
0.100 TO 0.199			0.01	0.03	0.04	0.19								
0.200 TO 0.399				0.01	0.02	0.09	0.38							
0.400 TO 0.599					0.01	0.06	0.25							
0.600 TO 0.999						0.03	0.15	0.34						
1.00 TO 1.99						0.01	0.07	0.17	0.30	0.48				
2.00 TO 3.99							0.03	0.08	0.15	0.24	0.34	0.47		
4.00 TO 5.99							0.02	0.05	0.10	0.16	0.23	0.31	0.41	
6.00 TO 7.99							0.01	0.04	0.07	0.12	0.17	0.23	0.30	0.38

(1) (2)

NOTE:

(1) FOR THE LENGTH-SECTION WIDTH (A) COMBINATIONS SHOWN IN THIS AREA THE MAX GAP WHICH CAN BE PULLED UP WITHOUT ADDING SHIMS IS 0.010 INCH

(2) FOR THE LENGTH-SECTION WIDTH (A) COMBINATIONS SHOWN IN THIS AREA THE MAXIMUM GAP WHICH CAN BE PULLED UP WITHOUT ADDING SHIMS IS 0.50 INCHES

(3) THESE GAPS MAY BE PULLED UP PROVIDING THE REQUIREMENTS OF STEP 3D (10) ARE SATISFIED

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R Allowable Gap Pullup for Aluminum and Titanium Alloy Parts
R Table 216 (Sheet 1)

EFFECTIVITY: ALL

001B

FLANGE HEIGHT (B), INCHES	LENGTH (L), INCHES												
	4.0	6.0	8.0	10.0	20.0	40.0	60.0	80.0	100.0	120.0	140.0	160.0	180.0
	MAX GAP (G), INCHES (3)												
0.018-0.022	0.03	0.07	0.14	0.22									
0.023-0.027	0.03	0.06	0.11	0.18									
0.028-0.032	0.02	0.05	0.09	0.15									
0.033-0.039	0.02	0.04	0.07	0.12	0.49								
0.040-0.049		0.03	0.06	0.09	0.39				(2)				
0.050-0.099			0.03	0.04	0.19								
0.100-0.199				0.02	0.09	0.38							
0.200-0.299					0.06	0.25							
0.300-0.499					0.03	0.15	0.34						
0.500-0.999		(1)				0.07	0.17	0.30	0.48				
1.00-1.99						0.03	0.08	0.15	0.24	0.36	0.47		
2.00-2.99						0.02	0.05	0.10	0.16	0.23	0.31	0.41	
3.00-3.99							0.04	0.07	0.12	0.17	0.23	0.30	0.38

NOTE:

(1) FOR THE LENGTH-FLANGE HEIGHT COMBINATIONS (B) SHOWN IN THIS AREA, THE MAX GAP WHICH CAN BE PULLED UP WITHOUT ADDING SHIMS IS 0.010 INCH

(2) FOR THE LENGTH-FLANGE HEIGHT COMBINATIONS (B) SHOWN IN THIS AREA, THE MAXIMUM GAP WHICH CAN BE PULLED UP WITHOUT ADDING SHIMS IS 0.50 INCHES

(3) THESE GAPS MAY BE PULLED UP PROVIDING THE REQUIREMENTS OF STEP 3D (10) ARE SATISFIED

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R Allowable Gap Pullup for Aluminum and Titanium Alloy Parts
R Table 216 (Sheet 2)

EFFECTIVITY: ALL

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(j) Fasteners in existing locations, which pass through shim, will be one diameter larger than original fasteners.

(k) Added fasteners will be same size and type.

(l) Shim must pick up a minimum of two attaching fasteners.

(m) Spacing of added attachments and edge distance requirements must be maintained.

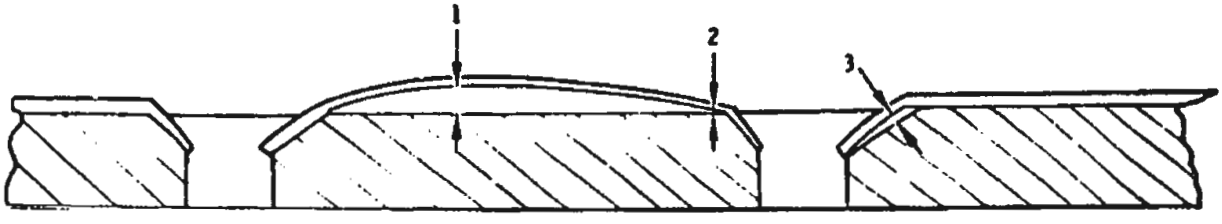
(3) Shimming of Tension Fitting Gap (Ref. Fig. 217)

(a) Use shims of 2024-T3 clad aluminum alloy for aluminum stringers and one-fourth hard CRES for steel stringers.

(b) Width of shim will be same width as fitting leg and length will be as required for additional rivets with proper spacing.

(c) Type "A" repair (Ref. Fig. 217).

• Mislocation of mating surfaces is limited to thickness of stringer web.



GAP LOCATION (SEE ILLUSTRATION)	MAXIMUM GAP ALLOWANCE	
	C.P. TITANIUM	ALL OTHER METALS
1 MIDWAY BETWEEN DIMPLES	0.005	0.008
2 ADJACENT TO DIMPLES	0.003	0.004
3 BETWEEN COUNTERSINK AND DIMPLE	0.003	0.004

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R
R

Gaps Under Dimpled Sheets
Table 217

- Fabricate and install shim to fill gap between mating surfaces.

- Attach with fitting rivets and additional rivets as required maintaining proper spacing and edge distance.

(d) Type "B" repair (Ref. Fig. 217).

- Mislocation of mating surfaces is limited to two times thickness of stringer web.

- Fabricate and install two shims of equal thickness to fill gap between mating surfaces.

- Shim adjacent to fitting to pick up fitting rivets and to extend past fitting to pick up additional rivets as required.

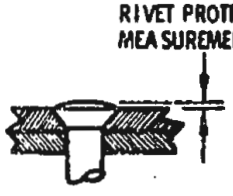
- Shim adjacent to stiffener web to extend past end of first shim as required, to pick up four rivets beyond end of first shim.

R - Maintain proper edge distance and spacing.

F. Wire Stitching

RIVETS	FUSELAGE STATIONS ⚠1		
	83 TO 409	500 TO 1453	1454 TO 2215
90% IN ANY ROW			+0.006 -0.000
85%		+0.005 -0.000	
70%	+0.004 -0.000		
29%	+0.005 -0.000		
14%		+0.007 -0.000	
9%			+0.008 -0.000
1%	+0.010 -0.000	+0.010 -0.000	+0.010 -0.000

NOTE:
⚠1 FOR FUSELAGE STATIONS BREAKDOWN, REFERENCE 6-20-00



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R Rivet Flushness Requirements
R Table 218

(1) Use 18 gauge tinned wire conforming to Federal Specification, QQ-W-414 for plastic laminate stitching.

(a) Use .051 inch diameter wire for all other applications.

(2) Dimensions of clinched staples will conform to Figure 218, no clearance is permitted under crown.

(3) Minimum edge distance will be .120 inch.

(4) Minimum spacing between staples will be .750 inch.

(5) Spacing between adjacent rows of staples will be approximately .250 inch.

(6) Clinched staples may exhibit tool marks and slightly flattened areas but will not be cut or grooved.

(a) Stapling of trim materials will be in accordance with Table 219 when stapling is specified.

Stapling of Trim Materials[1]
Table 219

DUO FAST STAPLE PART NUMBER	SIZE (IN INCHES)		MAX DISTANCE BETWEEN STAPLES (INCHES)	APPLICATION[2]
	WIDTH	LENGTH		
3012-D	.050	.038	.050	Stapling of all types of fabrics to wood in end grain.
			1.00	Stapling trim listings in place.
			0.50	Stapling 0.06 thick breakover trim strips in place.

Stapling of Trim Materials[1] (Cont)
Table 219

DUO FAST STAPLE PART NUMBER	SIZE (IN INCHES)		MAX DISTANCE BETWEEN STAPLES (INCHES)	APPLICATION[2]
	WIDTH	LENGTH		
308-D	0.50	0.25	0.50	General use for stapling all types of fabrics to wood where listings and breakover strips are not used.
306-D	0.50	0.19	0.50	Stapling all types of fabrics to wood not exceeding 0.19 thickness.
3416-D	0.15	0.50	1.25	Stapling of 0.25 max thick tack strips to wood. Glue shall be used in addition to the staples for the attachment of these tack strips.
346-D	0.15	0.19	0.25	Stapling of all types of fabric to wood where the staples are exposed.
348-D	0.15	0.25	0.25	Stapling of all types of fabric to curved wood on a radius of less than 5 inches.

Stapling of Trim Materials[1] (Cont)
Table 219

DUO FAST STAPLE PART NUMBER	SIZE (IN INCHES)		MAX DISTANCE BETWEEN STAPLES (INCHES)	APPLICATION[2]
	WIDTH	LENGTH		

NOTE: [1] The minimum edge distance on fabrics shall be 0.25 inch. Where the staple gun will not drive a tight staple, the staple shall be driven tight with a hammer.

[2] The use of the word "wood" includes lumber, plywood, and paper surfaced plywood.

G. Dimpling

(1) Dimpling methods will be used only when sheet thicknesses are within valves given in Table 204, unless otherwise specified by engineering.

(2) Perform dimpling only on sheet stock and other forms of rolled material shown in Table 220.

Dimpling Methods
Table 220

MATERIAL	METHOD OF DIMPLING				TOOL TEMPERATURE	
	CONVEN-TIONAL	NON-RAM COIN	RAM COIN	AUTO-MATIC	ROOM	HOT
3003-O, 5052-O 6061-W, T4 Bare Aluminum	Yes	Yes	Yes	Yes	Yes	500 to 550°F
Clad Aluminum Alloys 2024-T3, T4 and T42	Yes	Yes	Yes	Yes	Yes	1, 2, 4
2024-T36	Yes	Yes	Yes	Yes	Yes	No
2024-T6, T81 and T86	No	Yes	Yes	Yes	Yes	625 to 675°F

Dimpling Methods (Cont)
Table 220

MATERIAL	METHOD OF DIMPLING				TOOL TEMPERATURE	
	CONVEN-TIONAL	NON-RAM COIN	RAM COIN	AUTO-MATIC	ROOM	HOT
7075-T6 7178-T6	No	Yes	Yes	Yes[3]	No	500 to 550°F[4]
301, 302, 321 and 347 Annealed Stainless Steel	Yes	Yes	Yes	Yes	Yes	500 to 550°F
301-1/4H 302-1/4H Stainless Steel	Yes	Yes	Yes	Yes	Yes	No
301-1/2H or H 302-1/2H or H Stainless Steel	No	Yes	Yes	No	Yes	No
Low CarbonSteel	Yes	Yes	Yes	Yes	Yes	500 to 550°F
Annealed Commercial Pure Titanium 5	No	Yes	Yes	No	No	600 to 825 °F

Dimpling Methods (Cont)
Table 220

MATERIAL	METHOD OF DIMPLING				TOOL TEMPERATURE	
	CONVENTIONAL	NON-RAM COIN	RAM COIN	AUTOMATIC	ROOM	HOT
NOTE: [1] 2024-T3, 2024-T4 and 2024-T42 Clad aluminum shall be dimpled at room temperature except as noted in [2] below.						
[2] 500 to 550°F applies when 2024-T3, 2024-T4 and 2024-T42 Clad aluminum is dimpled simultaneously with 7075-T6 Clad aluminum which must be hot dimpled. Also for thin gauge 2024 (less than 0.020) where cold dimpling results in defective dimples.						
[3] 7075-T6 and 7178-T6 Clad aluminum may be automatic dimpled only when individual sheets are 0.032 thru 0.063 inch in thickness and the total joint thickness does not exceed the punch diameter for 7075 and does not exceed 0.125 for 7178.						
[4] See Step 3G(11)(B) for a special tool temperature.						
[5] Titanium alloys other than commercially pure shall not be dimpled.						

(a) Dimpling of extrusions and integrally stiffened skins is not permitted, unless otherwise specified by engineering.

(3) Radius type or sharp type dimples may be used, but incomplete dimples are not acceptable (Ref. Fig. 219).

(a) Metal thickness in dimple cone need not be as thick as parent metal.

(b) On hot formed dimples, extrusion of a small flash of cladding around edge of dimple cone is acceptable.

(4) Redimpling

(a) Incomplete dimples may be redimpled to correct depth providing same size dimple dies are used and

care is taken to insure redimpling in exact center of original dimple.

(b) Dimpled holes will not be redrilled and redimpled to a larger size.

(c) Do not redimple to reverse dimples.

(5) Skin Dimpling

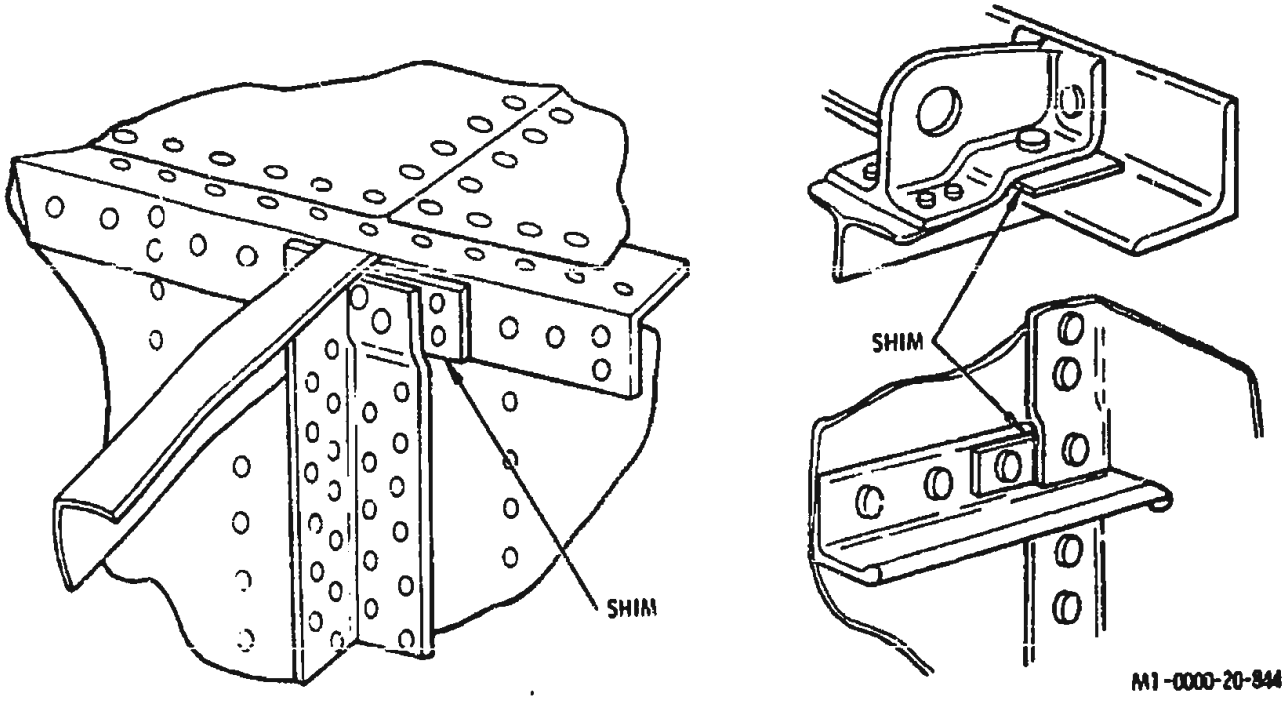
(a) Upper surface of skin dimple will have an included angle of 100 degrees.

(b) Dimple will be of correct diameter to produce degree of flushness required after rivet or screw is driven.

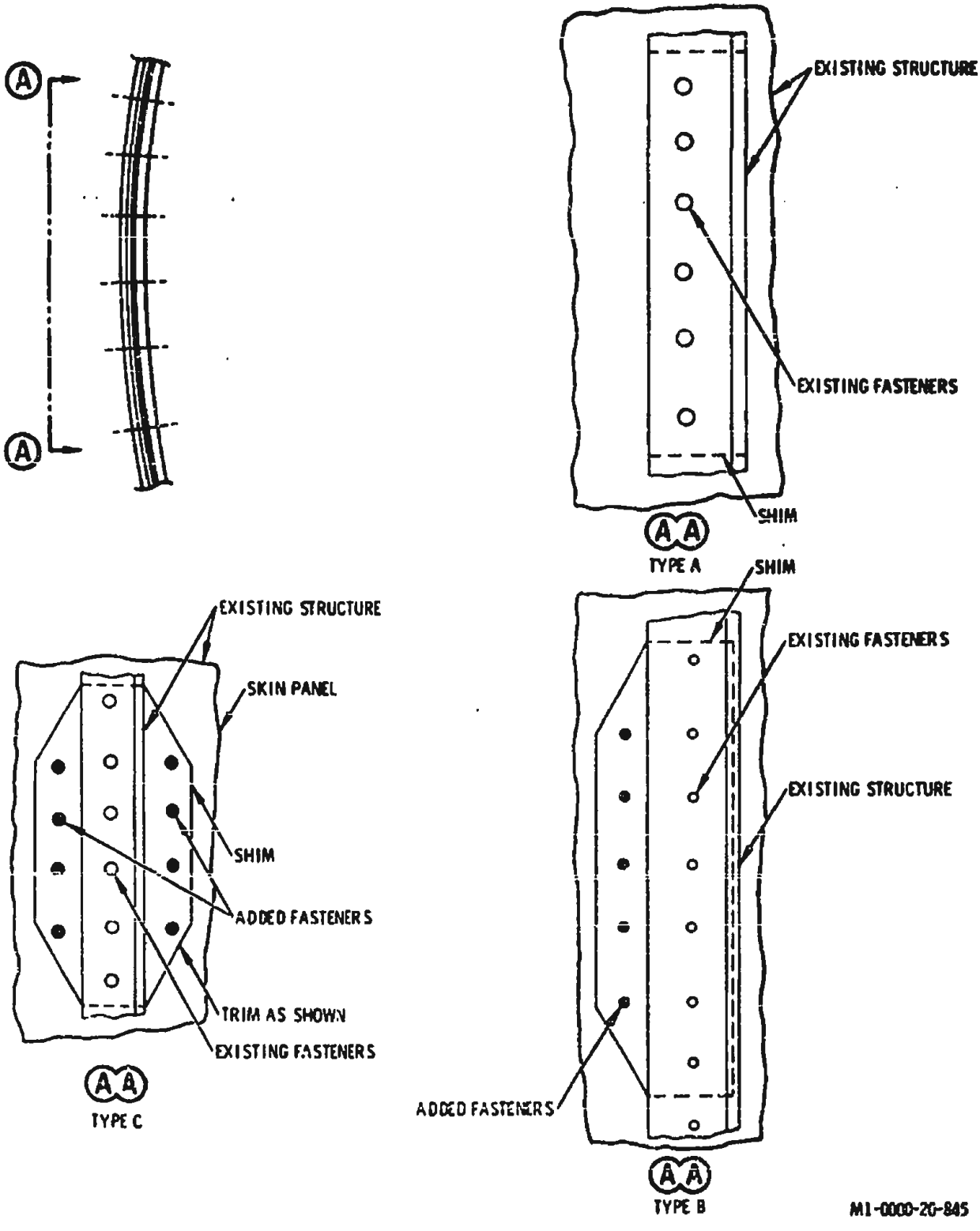
(c) A radius and an annular groove between edge of rivet head and edge of dimple will be considered normal and will not be cuase for rejection.

(d) Temporary protective coatings need not be removed from skins before cold dimpling, but must be removed before riveting.

(6) Sub-dimples



Shimming Gaps in Structural Joints
Figure 215



Shimming Gaps Other Than at Joints
Figure 216

(a) Sub-dimples in joints composed of several sheets will have included angles to insure correct nesting.

(b) A conventional dimple requires a sub-dimple with an included angle of 110 degrees.

(c) A coin dimple requires a sub-dimple with an included angle of 100 degrees.

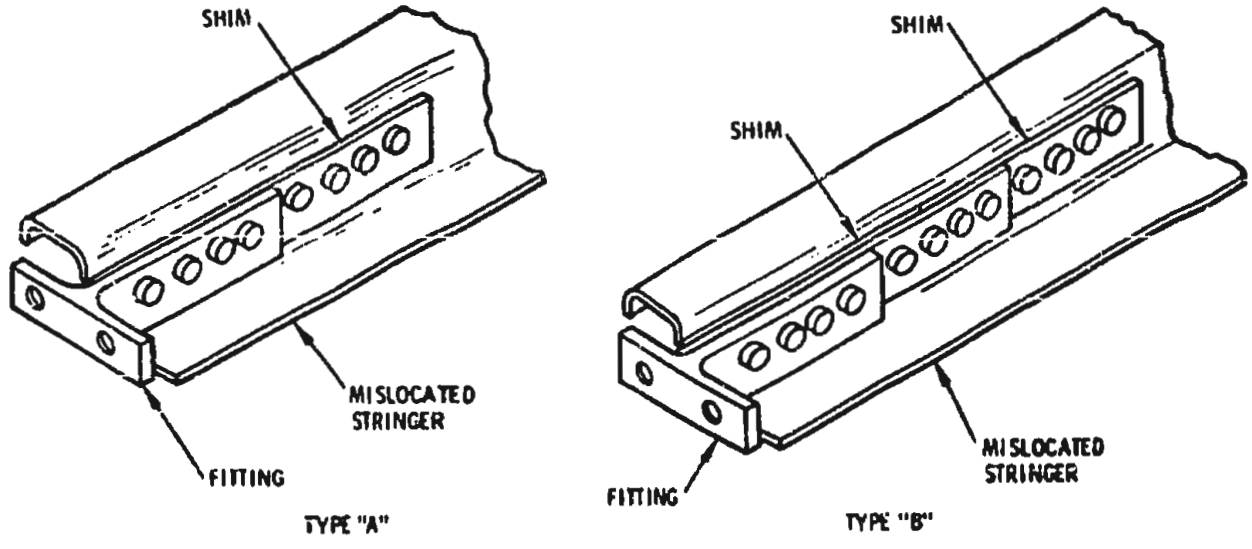
(d) Sub-dimple will be of correct diameter to mate with surface dimple and provide nesting and gap limits of Step 4D(10).

(e) If skin has been coin dimpled, then sub-dimple will also be coin dimpled.

(f) A conventional skin dimple may be nested into a coined sub-dimple.

NOTE: Requirements for sub-dimples do not apply to automatic riveting.

(7) Coin Dimpling



Shimming of Tension Fitting Gap
Figure 217

(a) Dimples formed by coin dimpling method, either hot or cold, will conform to Figure 220.

(b) Normal action of coining ram produces a flat ring around hole on underside of dimples and extrudes a thin projection of flash at edge of hole, markings and grooves in this flat area will not be shown to be defective.

(c) Nesting requirements for coin dimples will be similar to those given in Step 4D(10).

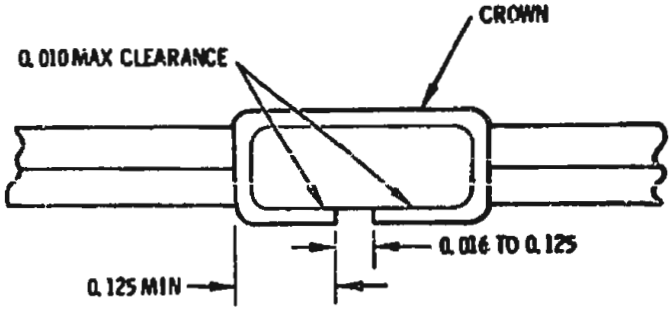
(d) Hole sizes will conform to Table 202 for rivets.

(e) Hole sizes for screws and bolts will be as specified on engineering drawings.

(8) Hot Dimpling

(a) Hot dimpling is permitted on materials as listed in Table 220.

(b) Conductive type dimpling.



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Dimensions of Clinched Staples
Figure 218

- Conductive type dimpling, as applied to coin dimpling, will be done with dimple dies heated to temperature specified in Table 220.

- Maximum duration of temperature application is limited to five seconds.

- Upper and lower surfaces of conduction type hot dimples will conform to angles given in Figure 220.

- Two sheets that are spotwelded together, except 2024-T81 and T86, may be dimpled as one sheet provided distance from edge of dimple to edge of spotweld is not less than .120 inch.

- Sheets of 7075-T6, 2024-T81 or 2024-T86 joined by adhesive will be dimpled separately before being joined (Ref. Table 204) for thickness limits.

- When parts are heated from only one side, application time of heat will be doubled and tool temperature increased up to 75 degrees Fahrenheit (23 degrees centigrade) above normal limits.

SATISFACTORY
RADIUS DIMPLE

SATISFACTORY
SHARP DIMPLE

UNSATISFACTORY
INCOMPLETE DIMPLE

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Dimple Form
Figure 219

• At no time will sheet temperature of unaged 2024-T3, T4, T42 or aged 7075-T6 and 7178-T6 aluminum alloy be greater than 400 degrees Fahrenheit (204 degrees centigrade) and not longer than two seconds.

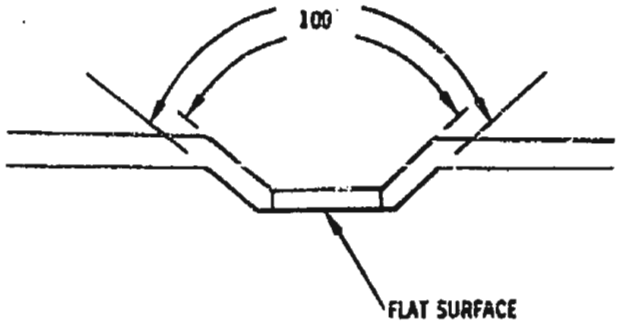
(9) Multiple Thickness Dimpling

(a) For materials listed in Table 220, except for 2024-T81 and 2024-T86, simultaneous dimpling of two sheets is permissible when assembly sequence makes it impractical to dimple each sheet separately.

(b) Total thickness of two sheets will not exceed values given in Table 204.

(c) Three sheets of 7075-T6 clad aluminum alloy may be hot dimpled simultaneously when assembly sequence makes it impractical to dimple each sheet separately.

(d) Total thickness of three sheets will not exceed maximum thickness permitted for two sheets in Table 204 by more than .010 inch.



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Ram Coin Dimple
Figure 220

(10) Percussion Dimpling (hand buck bar)

(a) Percussion dimpling of single sheets is permissible using flow form type equipment (AT series or equivalent).

(b) Materials listed in Table 220, with exception of 2024-T81 and 2024-T86 may be dimpled by this method.

(c) When dimpling materials that require hot forming, reference Step 4G(11).

(d) Thickness limits for percussion dimpling woll be same as coin dimpling, single sheet limits (Ref. Table 204).

(11) Dimpling Aluminum Compressed Honeycomb Core Panels

(a) Hot and cold dimpling of aluminum compressed honeycomb core panels, reference Equipment and Materials, is permitted.

(b) Configuration of dimple will be in accordance with Figure 221.

(c) Use hot dimpling on aluminum compressed honeycomb core panels which are to be used on external skin surfaces.

(d) On internal surfaces, hot dimpling or cold dimpling is optional.

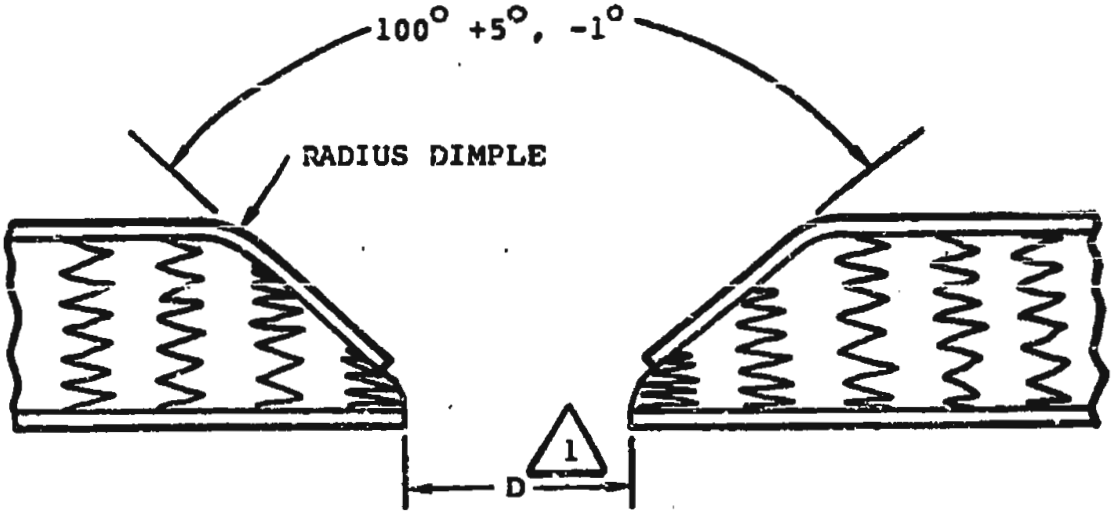
(e) Tool temperature for hot dimpling will be 275 to 325 degrees Fahrenheit (135 to 162 degrees centigrade), which only the punch will be heated.

(12) Dimple Quality

(a) Any circumferential cracks in base metal of dimple, or radial cracks longer than .031 inch at edges of cold dimpled holes will be cause for rejection.

(b) Smaller visible cracks in hole edges are acceptable on approximately 10 percent of holes in any one row between two structural members, but not in any two adjacent holes.

(c) Nesting requirements, hole sizes, metal thickness, extruded cladding at hole edges, markings and grooves, and form of dimples will be as described



RADIUS DIMPLE CONFIGURATION

FASTENER DIA, NOMINAL	DIMENSION D (1) +.005, -.000
5/32	.161
3/16	.219

(1) DIMENSION D IS THE DRILLED DIMENSION FOR BOTH TOP AND BOTTOM SHEET.

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Radius Dimple Configuration
Figure 221

and allowed in preceding paragraphs, figures, and tables.

(d) Dimple test specimens of same material, gage, and hole size and aspect before performing actual dimple.

R ANTI-CHAFING PROTECTION OF STRUCTURE
R CONTACTING EXTERNAL DOORS AND FILLETS
R MAINTENANCE PRACTICES

R 1. General

R This procedure establishes requirements and materials necessary
R for application of anti-chafing coating, to surfaces of parts,
R assemblies and surfaces of structure in contact with hinged and
R fastened on maintenance doors.

R All structure in contact with mating surfaces of access doors or
R fillets installed with quick maintenance fasteners such as
R widely spaced screws, Airlocs, Dzus and etc., must have
R anti-chafing coating applied to structure only in contact area.

R NOTE: This does not apply to external access doors which seal
R fuel tanks to doors which have their own seals, to clamp
R on doors or to surface adjacent to hinged portion of
R door.

R 2. Equipment and Materials

R Cleaner, Petrolium Base, For Primed Metals, Non-photochemically
R Reactive: Leeder Chemical Co, (FSCM 2842), P/N 101KE; Lockheed
R P/N LCM32-1087 or equivalent.

R Compound, Sealing, High Temp Resistant, Quick Repair: Products
R Research Co, (FSCM 21940), P/N PR5701-K; Lockheed P/N LCM40-1218
R Type II or equivalent.

R Compound, Sealing, Integral Fuel Tank: Products Research Co,
R (FSCM 21940), P/N PR7401; Lockheed P/N LCM40-2180 or equivalent.

R Methyl-Ethyl-Ketone: Open Vendor; Fed Sped P/N TT-M-261 or
R equivalent.

R Parting Agent, Non-contaminating: Open Vendor; Lockheed P/N
R LCM22-1246 or equivalent.

R Talc, Purified, U.S.P. Grade: Open Vendor; Lockheed P/N
R L31.1700 or equivalent.

R 3. Maintenance Practices

R WARNING: USE METHYL-ETHYL-KETONE IN WELL-VENTILATED AREA.
R AVOID FLUID CONTACT WITH SKIN AND EYES. PROLONGED
R EXPOSURE MAY RESULT IN SKIN OR EYE IRRITATION. KEEP
R AWAY FROM HEAT, SPARKS AND OPEN FLAME.

R USE PETROLIUM BASE CLEANER IN WELL-VENTILATED AREA.
R DO NOT INHALE VAPOR AND AVOID CONTACT WITH SKIN AND
R EYES. KEEP AWAY FROM HEAT, SPARKS AND OPEN FLAME.

R KEEP VOLATILE CLEANING SOLVENTS IN AIR TIGHT
R CONTAINERS, TIGHTLY CLOSED WHEN NOT IN USE. KEEP
R SOLVENT SOAKED RAGS FROM ACCUMULATING IN WORK AREA.

R A. Cleaning

R (1) Clean surfaces thoroughly by wiping with cloth dampened
R with petrolium base cleaner or Methyl-Ethyl-Ketone.
R Wipe immediately dry with clean dry cloth.

R NOTE: Do not remove primer from structure if painted.

R B. Masking

R (1) Mask surfaces to confine sealing compound as specified
R in Para. 1, General.

R C. Application of Sealant

R WARNING: USE SEALERS IN WELL-VENTILATED AREA. AVOID
R CONTACT WITH SKIN AND EYES. KEEP AWAY FROM HEAT,
R SPARKS OR OPEN FLAME.

R (1) Mix sealant in proportions recommended by manufacturer.

R (2) Use stiff bristle brush or other means which will
R provide a smooth even coating of sealant.

R (3) Apply coating of sealant (SCM40-1218 type II)
R approximately .010 inch thich on mating surface or on
R fillet contact area.

R NOTE: LCM40-2180 sealant may be used where high
R ambient temperature, large size or complexity,
R makes longer application life necessary.

R LCM40-1218 sealant is suitable for application a
R minimum of 15 minutes after accelerator has been
R added to compound at a temperature between 75
R and 79 degrees Farenheit (23.88 to 26.11 degrees
R Centigrade) and relative humidity between 45 and

R 55 percent.

R LCM2180 sealant is suitable for application for
R a minimum of one hour after accelerator has been
R added to compound at a temperature between 75
R and 79 degrees Farenheit (23.88 to 26.11 degrees
R Centigrade) and relative humidity between 45 and
R 55 percent.

R D. Curing

R (1) Cure LCM40-1218 type II sealant for eight hours at a
R temperature over 70 degrees Farenheit (21.11 degrees
R Centigrade), or approximately two hours air dry and additional two hours between 120 and 130 degrees Farenheit (48.88 to 54.44 degrees Centigrade).

NOTE: If LCM40-2180 type II sealant is used cure for 24 hours at a temperature over 70 degrees Farenheit (21.11 degrees Centigrade), or approximately two hours air dry and additional three hours between 120 and 130 degrees Farenheit (48.88 to 54.44 degrees Centigrade).

(2) Apply parting agent (LCM22-1246) or talc to cured sealing compound before closing doors or other installations.

R R ENVIRONMENTAL SEALING
MAINTENANCE PRACTICES

R 1. General

R This section establishes requirements for sealing aircraft surfaces to prevent ingress of environmental corrosion substances effecting aerodynamic smoothing and fairing, and for insulating dissimilar metals and fasteners. Affected exterior surfaces are those normally wetted by water while aircraft is in the air or on the ground. This includes control surfaces, control surface wells, other exterior fairings and locations (Ref. Step 4.T.). Areas requiring environmental sealing are as follows:

R A. All exterior splice joints with at least one edge leading to an external surface must be surface sealed. Exterior splice joints regardless of location, having all members including the joint, made from titanium, stainless steel, Iconel, or a combination of these, do not need sealing. Joints that consist of aluminum and are of above materials, need only have aluminum portion sealed. Make certain that aluminum interface is completely filled with sealant (including butt joint).

R B. All permanent exterior fasteners penetrating fuselage pressure vessel below WL219, all permanent exterior fasteners below MHB in aft body and all permanent fasteners, regardless of location, positioned at skin splices or penetrating bonded joints, must be wet installed with sealant when joining metal parts.

R NOTE: MHB refers to Maximum Half Breadth, which is the widest fuselage width at a given fuselage station.

R All permanent exterior fasteners located on wing leading and trailing edges, in wheel wells, in the keelson, and those on entire exterior of empenage must be wet installed with sealant.

R NOTE: Stainless steel, titanium or nickel alloy fasteners joining titanium to tiatnium stainless steel to stainless steel, Iconel to Iconel or a combination of these joints, do not need wet sealing on installation regardless of location.

R C. All exterior joggles, gaps and other surface irregularities must be aerodynamically smoothed and faired where required (Ref. Step 4S).

R D. All static discharger retainers must be sealed (Ref. Step
R 4Q).

R E. All stringers, longerons, ribs, frames and attachments to
R fuselage skin located below WL219 in pressurized area,
R including the keelson, and below MHB (Maximum Half Breadth)
R in aft body must be faying surface sealed during assembly.
R Titanium to titanium, stainless steel to stainless steel,
R Inconel to Inconel or combination of these joints,
R regardless of location do not need sealing. At FS983 and
R FS1223, faying surface sealing of frame to skin joints is
R required only below WL199.5.

R F. All permanent dissimilar metal assemblies must be sealed in
R Faying surfaces and all dissimilar permanent interior and
R exterior metal fasteners must be wet installed except the
R following areas that do not require sealing.

R (1) Faying surfaces between titanium fail safe straps and
R aluminum stringers or frames above WL219. Fasteners
R through these areas must be wet installed with sealant.

R (2) Lockclad cable assemblies unless otherwise required by
R engineering.

R G. Skin splices and fasteners located in galley toilet and
R battery compartment areas, joggles, recesses and corners in
R bilge, must be post assembly fillet and brush sealed in
R addition to faying surface sealing and wet installing
R fasteners. Exposed sealant in these areas must be
R overcoated [Ref. Step 4U(f)] to protect against damage by
R acid, alkaline and phosphate ester fluids.

R 2. Equipment and Materials

R Adhesive, Silicone, One Part, Room Temperature Vulcanizing;
R General Electric FSCM01139, P/N RTV157; Lockheed P/N LCM30-2085
R or equivalent.

R Cleaner, Petroleum Base; Leeder Chemical Co., FSCM17209 P/N
R 101KE; Lockheed P/N LCM32-1087 or equivalent.

R Compound, Aerodynamic Sealing; Products Research Corp.,
R FSCM83574, P/N PR8501F; Lockheed P/N C-40-1279 or equivalent.

R Compound, Corrosion Preventive; Open Vendor; Lockheed P/N
R MIL-C-16173 or equivalent.

R Compound Sealing, Faying Surface Corrosion Inhibitive, Extended
R Assembly Time; Products Research Corp., FCM83574, P/N PR-1431G

(Class B-12), P/N PR-8701F (Class 5-12); Lockheed P/N LCM40-2121 or equivalent.

Compound, Sealing, Floor Panel; Products Research Co., FSCM83574, P/N PR1227; Lockheed P/N EPS 40.2470 or equivalent.

Compound, Sealing, Heat Resistant; Products Research Co., FSCM83574, P/N PR7301; Lockheed P/N C-40-769 or equivalent.

Compound, Sealing, High Temperature Resistant, Quick Repair; Products Research Co., P/N PR-5601-K (Type I), P/N 5701-K (Type II); Lockheed P/N LCM40-1218 or equivalent.

Compound, Sealing, Integral Fuel Tanks; Products Reseatch Co., ESCM83574, P/N PR7301; Lockheed P/N LCM40-2180 or equivalent.

Compound, Sealing, Low Adhesion; Products Research Co., FSCM83574, P/N PR1301HT-K; Lockheed P/N C-40-769 or equivalent.

Fabric Glass, Scrim; United Merchants, FSCM92252 P/N 196; Lockheed P/N EPS22.461 or equivalent.

Naptha, Aliphatic; open vendor, Federal Specification TT-N-95 or equivalent.

Parting Agent, Silicone; Ram Chemicals Inc., FSCM22401, P/N RAM 225; Lockheed P/N LCM22-1246 (EPS22.9010) or equivalent.

Primer Coating Epoxy, Phosphate Ester Resistant; Deft Inc. Chemical Coating Div., FSCM33461, P/N 02-GN-28; Lockheed P/N LCM37-1035 or equivalent.

Protective Coating; Bostic, FSCM71091, P/N 473-20; Lockheed P/N EP537.4598 or equivalent.

Solvent, Cleaning 1,1,1 Trichloroethane; Open Vendor; Federal Specification O-T-620 or equivalent.

Tape, Impregnated, Lacing and Tying; Western Filament Inc., FSCM00768, P/N MIL-T-43435; Lockheed P/N EP525.1122 or equivalent.

Tape Masking, Paper, Pressure Sensitive; Open Vendor, Federal Specification TT-N-95 or equivalent.

Compound, Sealing Heat Resistant; Products Research Co., FSCM83574, P/N PR1910; Lockheed P/N C-40-969 or equivalent.

R Surfacer, Fast Cure; Dexter Midland, FSCM98795, P/N 8-W-65; Lockheed P/N EPS37.7254 or equivalent.

R 3. Referenced Procedures

R 28-11-00 Tank - Maintenance Practices

R 20-21-00 Standard Practices

4. Maintenance Practices

A. Handling and Storage

(1) Mark containers of freshly mixed sealing components to identify material specification and class of sealant.

(2) Pre-mix and freeze two part sealing compounds in sealed containers to prevent contamination and store at -20 degrees Farenheit (-28.89 degrees Centigrade) or below. Containers must be marked to identify material specification, class, date of mixing, material manufacturer and batch number.

(3) Thaw pre-mixed and frozen sealants to a temperature of 60 degrees Farenheit (15.55 degrees Centigrade) or to a temperature above dew point if dew point is above 60 degrees Farenheit (15 degrees Centigrade).

NOTE: Quick frozen is a condition where sealant temperature is reduced from ambient to -20 degrees Farenheit, (-28,89 degrees Centigrade) or below within 10 minutes from time of mixing.

Sealants may also be purchased in cartridges, premixed and frozen by vendor, and labeled as described in Step 4A.

(4) Store at -20 degrees Farenheit (-28,89 degrees Centigrade).

B. Machining and Fitting of Parts

(1) Drill, deburr and fit parts before surface preparation where practicable.

(2) Clean parts (Ref. Step 4C) where fasteners are installed on automatic fastening machines or where interference fit fasteners are used and parts can not be disassembled after drilling holes.

(3) Apply sealant, clamp parts together, drill holes and install fasteners.

C. Cleaning

R WARNING: USE TRICHLOROETHANE IN WELL VENTILATED AREA. DO NOT INHALE VAPOR AND AVOID CONTACT WITH SKIN OR EYES. EXPOSURE MAY RESULT IN LUNG, SKIN OR EYE IRRITATION.

R USE PETROLEUM BASE CLEANER IN WELL VENTILATED AREA. DO NOT INHALE VAPOR AND AVOID CONTACT WITH SKIN AND EYES. KEEP AWAY FROM HEAT SPARKS AND OPEN FLAME.

R KEEP VOLATILE CLEANING SOLVENTS IN AIR TIGHT CONTAINERS TIGHTLY CLOSED WHEN NOT IN USE. KEEP SOLVENT SOAKED CLOTHS FROM ACCUMULATING IN WORK AREA.

R (1) Clean surfaces with clean cloth dampened with LCM32-1087 cleaner or O-T-620 Trichloroethane solvent.

R (2) Immediately wipe surfaces dry with clean cloth while solvent is still wet (Ref. Fig. 201).

R D. Application of Primer

R (1) Apply primer in a continuous film approximately 0.0005 inch thick and free of pinholes.

R (2) Apply primer to base metal or over a cured organic finish.

R (3) Apply primer to all surfaces to which sealant must stick.

R (4) Allow to dry for at least one-half hour.

R NOTE: For best results, apply sealants and primers where temperature is between 60 and 100 degrees Farenheit (15.55 to 37.77 degrees Centigrade) and relative humidity between 20 and 85 percent.

R E. Application of Sealing Compound

R CAUTION: WHEN USING LCM40-2121 CLASS S SEALANT, ALLOW SOLVENTS TO FLASH OFF FOR A MINIMUM OF ONE-HALF HOUR BEFORE MATING PARTS.

R (1) Apply sealing compound after surface preparation.

R (2) Apply sealing compound within application time and assemble parts within assembly times specified in Table 201.

R F. Environmental sealing of permanent joints

R (1) Faying Surface Sealing

R CAUTION: USE C-40-969 SEALING COMPOUND WHERE OPERATING
R TEMPERATURES EXCEED 250 DEGREES FARENHEIT,
R (121.11 DEGREES CENTIGRADE) (REF. STEP 4T).

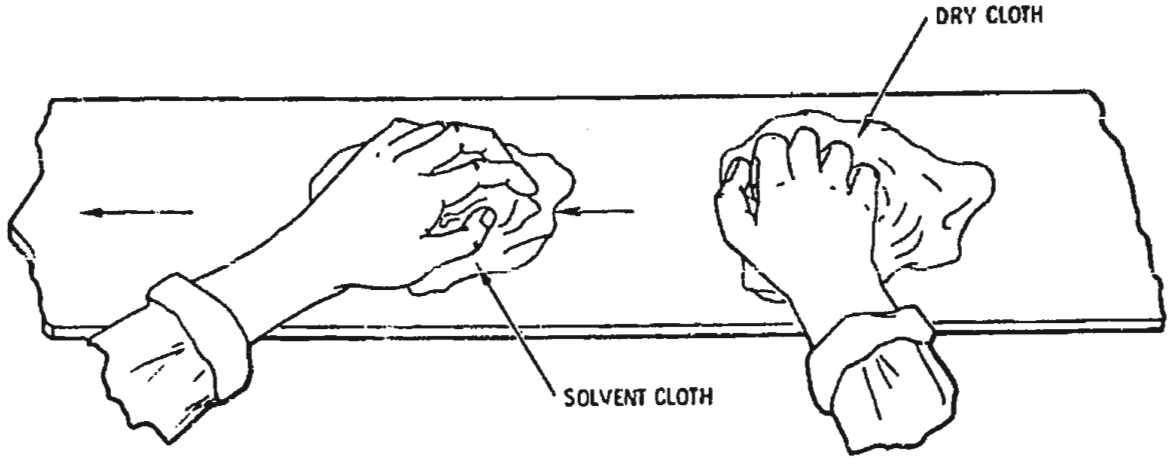
R (a) Seal faying surfaces of all permanent exterior
R skin splices during assembly using LCM40-2121
R sealing compound except as noted in Step 4T.

R (b) Seal all dissimilar metals in faying surfaces
R regardless of location except as noted in Step
R 1F(1).

R (c) Completely cover surface of doubler or mating
R flange with enough sealing compound to fill faying
R surface gap.

R (d) Inspect all edges of joint for a continuous bead
R of sealant after assembly and before excess
R sealant is removed.

R (e) Remove excess sealant material except for a thin
R film.



NOTE:

USING A CLEAN COTTON CLOTH, MOISTENED WITH LCM 32-1087 OR O-T-620, WIPE THE AREA CLEAN OF GREASE OR PENCIL MARKS. BEFORE THE CLEANER AIR DRIES, WIPE DRY WITH ANOTHER CLEAN DRY COTTON CLOTH.

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R Cleaning
R Figure 201

APPLICATION, ASSEMBLY, AND CURE TIMES OF SEALING COMPOUNDS

SEALING COMPOUND	TIMES IN HOURS					
	APPL LIMIT (1)	ASSY LIMIT (INCLUDES APPL) (1)	APPROXIMATE CURE TIMES (2) STD CURE 75 ±10°F	ACCELERATED CURE (3) AT 75 ±10°F	PLUS	AT 125 ±10°F
LCM40-2180 TYPE I & II	2	2	72	1/2	PLUS	3
TYPE III	2	2 (4)	72	1/2	PLUS	3
LCM40-1218 TYPE I & II	1/4	1/4	24	1/2	PLUS	1
C-40-1279	2	2	72	1/2	PLUS	1
LCM40-2121 B12 & S12	12	20	240	24	PLUS	24
B24 & S24	12	80	480	24	PLUS	48
B48	12	120	1000	24	PLUS	64
S40	12	120	1000	24	PLUS	64
C-40-769 TYPE I	1/2	1/2	24			
TYPE II	3	3	24			
C-40-969 TYPE I & II, CI A	2	2	24			
TYPE II, CI C	8	20	500			
EPS 40.2470	2	2	24			

NOTE

(1) APPLICATION AND ASSEMBLY LIMITS OF SEALING COMPOUND ARE MAXIMUM FOR AMBIENT CONDITIONS OF TEMPERATURES UP TO 95 DEGREES FARENHEIT, 35 DEGREES CENTIGRADE AND BETWEEN 45 AND 55 PERCENT RELATIVE HUMIDITY. HIGHER TEMPERATURES OR HUMIDITY WILL DECREASE APPLICATION AND ASSEMBLY LIMITS. TEMPERATURES BELOW 60 DEGREES FARENHEIT, 15.55 DEGREES CENTIGRADE OR HUMIDITY BELOW 20 PERCENT MAY PREVENT SEALANT FROM CURING PROPERLY.

(2) CURING BEGINS AT SAME TIME AS THAW OF FROZEN MATERIAL.

(3) ACCELERATED CURE MUST CONSIST OF CURING AT 65 TO 85 DEGREES FARENHEIT, 18.33 TO 29.44 DEGREES CENTIGRADE FOR HOURS NOTED (REF. TABLE 201) FOLLOWED BY CURING AT 115 TO 135 DEGREES FARENHEIT, 46.11 TO 57.22 DEGREES CENTIGRADE FOR HOURS NOTED (REF. TABLE 201). IF ASSEMBLIES WITH SEALED FAYING SURFACES HAVE BEEN ALLOWED TO CURE AT ROOM TEMPERATURE FOR TWO OR MORE DAYS, THE NUMBER OF HOURS AT ACCELERATED ROOM TEMPERATURE MAY BE REDUCED. EXAMPLE: LCM40-2121, B12: TWO DAYS AT ROOM TEMPERATURE PLUS ADDITIONAL SIX HOURS AT 115 TO 135 DEGREES FARENHEIT, 46.11 TO 57.22 DEGREES CENTIGRADE.

(4) INCLUDES ONE-HALF (1/2) HOUR FOR SOLVENT FLASH OFF.

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R NOTE: When using LCM40-2121 B12 sealant, a
R squeeze out bead of one-eighth inch maximum
R diameter may remain.

R (f) Check mating surfaces for adequate amount of
R sealant where squeeze out is not visible because
R of contour mismatch, corner radii, etc.

R (g) Fill empty spaces in surface edge that could trap
R and keep moisture with LCM40-2180.

R (h) Wet install fasteners within assembly time of
R faying surface sealant, where this is not possible
R use temporary screw type fasteners in every third
R hole and at ends to pull joints together until
R permanent fasteners can be installed.

R G. Modified Faying Surface Sealing for Door Frame Triplers

R (1) When installation of fasteners for door frame triplers
R around door frame cut-outs must be delayed until
R assembly is mated to adjacent assembly, apply faying
R surface sealant only to areas that are permanently
R fastened.

R (2) During subsequent assembly, just before installing
R fasteners, inject sealant into faying surface to a
R minimum distance of one inch from edge around entire
R outside surface of unsealed area. This can be seen by
R presence of sealant in first row of fastener holes.

R H. Filling of Voids or Channels

R CAUTION: DO NOT DRILL NEAR SEALANT UNTIL CURED AND COVERED
R TO PROTECT FROM CHIP EMBEDDING.

R IN DESIGNATED HIGH TEMPERATURE AREAS USE C-40-969
R SEALANT (REF STEP 4T).

R (1) Seal voids or channels created by assembly of parts
R using one of the following methods:

R (a) Wet pack with LCM40-2180 Type I sealant while
R parts are being assembled.

R (b) Inject LCM40-2180 Type I sealant immediately after
R parts are assembled while area is free of chips
R and dirt and while faying surface sealant is still
R fresh, until void is completely filled.

R I. Sealing of Exterior Lower Wing Skin to Spar Joints - Wing
R Box

CAUTION: SEAL STRUCTURE WHICH HAS BEEN PAINTED ONLY WITH DETAIL FINISH TO MAKE CERTAIN SEALANT WILL STICK TO STRUCTURE.

(1) Fillet seal entire exterior using joint created by mating of lower wing assembly and front and rear spar caps of using box.

(2) Where fittings joggle over joints along front and rear spar and gap created does not permit filleting and clear drainage, fill with LCM40-2180 Type 1 sealant.

(3) Complete following sealing for added corrosion protection in torque box area.

(a) After solvent cleaning, form a dam with LCM40-2180 Type I sealant from skin spar cap joint aft to skin trailing edge at locations outboard and inboard of torque box as shown on engineering drawings.

R (b) Make dam triangular in shape, about one inch wide at base and about one inch high to prevent fluids weaving inboard.

(c) After solvent cleaning interior of main landing gear torque box lower surface, fill space created at inboard inter section of torque box sides, spar cap and lower skin with LCM40-2180 Type I sealant to prevent drainage inboard.

(d) Fillet seal edges of joints formed by mating of parts on lower surface structure with LCM40-2180 Type I sealant.

(e) Brush a coat of LCM40-2180 Type II sealant about 0.025 inch thick on entire lower surface structure and fasteners of torque box area, including fitting bottom flanges. Sealant must extend over edges of skin to spar cap and rib joints, to cover lower section of cap, fittings and about one inch up vertical legs of parts.

(f) Keep drain holes open.

(g) After sealant has cured in torque box area, spray lower half of cavity with a layer of MIL-C-16173 Grade 4 corrosion preventive compound.

J. Exterior Butt Joint Sealing

R (1) Seal exterior skin butt joints with aluminized
R C-40-1279 sealant, except in areas operating above 250
R degrees Farenheit (121.11 degrees Centigrade) where
R LCM30-2085 Type I adhesive must be used.

R K. Wet Installation of Permanent Fasteners

R (1) Wet install permanent fasteners with LCM40-2121 sealant
R except in areas operating above 250 detrees Farenheit
R (121.11 degrees Centigrade) where LCM30-2085 Type I
R adhesive must be used (Ref. Step 4T).

R NOTE: Install all fasteners completely within work
R life of sealant.

R (2) Remove sealant which leaks on exterior surfaces,
R leaving a ring of sealant around each fastener head.

R NOTE: There is no need to remove sealant around
R fastener nut or upset head on interior surfaces.

R L. Installation of Laminated Shims

R (1) Install laminated shims, that have not been primed with
R FR (Float Resistant) primer, wet with LCM40-2180 Type I
R sealant. After shim installation, apply a fillet of
R same sealant to edges of shim.

R M. Titanium Clip to Aluminum Bulkhead Sealing

R NOTE: Titanium clips used to attach electrical equipment to
R the bulkhead at FS983 must be sealed to prevent
R galvanic corrosion but must be electrically bonded to
R meet electrical system requirements.

R (1) Assemble clip with LCM40-2180 Type I sealant.

R (2) Smooth out excess sealant squeezed out of faying
R surface to a fillet around joint.

R N. Environmental Sealing of Non-Permanent Joints

R (1) Fill gaps between structure and access and inspection
R doors and plates as wing upper surface with C-40-769
R Type I or II sealant and associated removable fasteners
R installed wet with C-40-769 Type I or II sealant.

R NOTE: Install all other removable fasteners dry,
R except where engineering documents or drawings
R specify wet installation of removable fasteners.

O. Sealing of Dissimilar Metal Removable Parts (e.g., Titanium Scuff Plates, Flap Tracks and Steel Liners)

(1) Apply coat of release agent EPS22.9010 to mating surface of removable part.

(2) Allow release agent to air dry.

(3) Assemble removable part to aluminum structure with faying surface sealant (Ref. Step 1F(1).

NOTE: Seal MLG (Main Landing Gear) door removable access covers and plug buttons as outlined in Step 4P.

P. Sealing of screwed on Access Plates and Covers (Exterior Skin Surface Excluding Fuel Tank Access Doors)

CR NOTE: Sealing does not apply to covers containing a gasket,
CR covers which do not exhibit chafing of mating
CR surfaces or covers which do not exhibit area
CR corrosion due to moisture penetration.

(1) Seal non hinged, screwed on inspection access plates or covers which do not contain a mechanical gasket.

(a) Clean faying surfaces, apply coat of release agent EPS22.9010 to surface of removable part and allow to air dry.

(b) Apply about 0.020 inch thick layer of aluminized sealant C-40-1279 to mating surface of permanent structure.

(c) Immediately install removable part and smooth squeeze out around outer surface, flush with mating structure to fill gap while sealant is still wet.

CAUTION: CLEAN AREAS AROUND ACRYLIC WINDOWS AND SURFACES MADE OF PLASTIC, REINFORCED PLASTIC OR FINISHED WITH ORGANIC COATING WITH TT-N-95 TYPE II ALIPHATIC NAPHTHA.

BE CAREFUL TO PREVENT CLEANING SOLVENT FROM GETTING INTO FAYING SURFACES AND ON ANY UNCURED SEALANT.

(d) Remove excessive sealing compound leaking from joints and fastener holes with clean cloth dampened with LCM32-1087 cleaning solvent.

Q. Static Discharger Retainers

(1) Use C-40-1279 sealing compound to assemble static discharger retainers.

(2) Wet install fasteners and fillet seal outer surface of static discharger retainers using C-40-1279 sealant.

R. Sealing of Control Rods

(1) Adjustable Rod Ends

(a) Apply MIL-C-16173 Grade 4 corrosion preventive compound to adjusting threads of rod ends.

(2) Non Adjustable rod ends

(a) Wet install non-adjustable rod ends, including fasteners, with LCM40-2121 sealing compound.

(3) Attaching Bolts

(a) Apply MIL-C-16173 Grade 4 corrosion preventive compound to shank of attaching bolt and inner bore of unplated bearing.

(4) Adjustable Rod Ends With Nine-Sixteenth Inch Threads or Greater

(a) Before installing adjustable rod end, thread jam nut and washer up full length of thread and fill keyway with MIL-C-16173 Grade 1 corrosion preventive compound. Coat threads with MIL-C-16173 Grade 1 or Grade 4 before installing.

S. Aerodynamic Smoothing and Fairing

(1) Seal and smoothen butt joints, voids, holes, offsets, joggles and surface irregularities on aircraft exterior using aluminized C-40-1279 sealant.

(2) Inspect cured sealant to see if sealant has filled gap to surface of skin. Shrinkage depression on curing is acceptable (Ref. Fig. 202).

(3) Seal high temperature area surfaces with LCM30-285 Type I adhesive (Ref. Step 4T).

NOTE: Do not aerodynamically seal edges of joints having machined chamfers (i.e. girth straps).

(4) Before applying sealant to joggles, mask areas adjacent to surface being sealed with LU-T-106 Type I masking tape.

(5) Fill joggles with sealant and make length of taper approximately three times thickness of metal (Ref. Fig. 202) or as noted on applicable smoothness drawings.

NOTE: Where possible, applied sealant may be covered with a strip of polyethylene film to facilitate smoothing and to protect sealant from chips and other contamination until it has reached a tack-free condition.

T. Additional Sealing Requirements

(1) Faying surface seal and wet install fasteners of all stringers, longerons, ribs, frames and attachments to fuselage skin, located below WL219 in pressurized area and beneath the MHB (Maximum Half Breadth) in afterbody as outlined in Step 4F.

NOTE: Passenger doors, whose areas intersect this panel splice, need not have the stringers sealed in the faying surfaces.

Maximum Half Breadth is defined as widest fuselage width at a given fuselage station.

(2) Aerodynamically and environmentally seal high temperature areas, where temperature will exceed 250 degrees Farenheit (121.11 degrees Centigrade), with silicone sealant. Affected areas are as follows:

(a) Center engine air inlet lip at F.S. 1623.5 to F.S.1641.

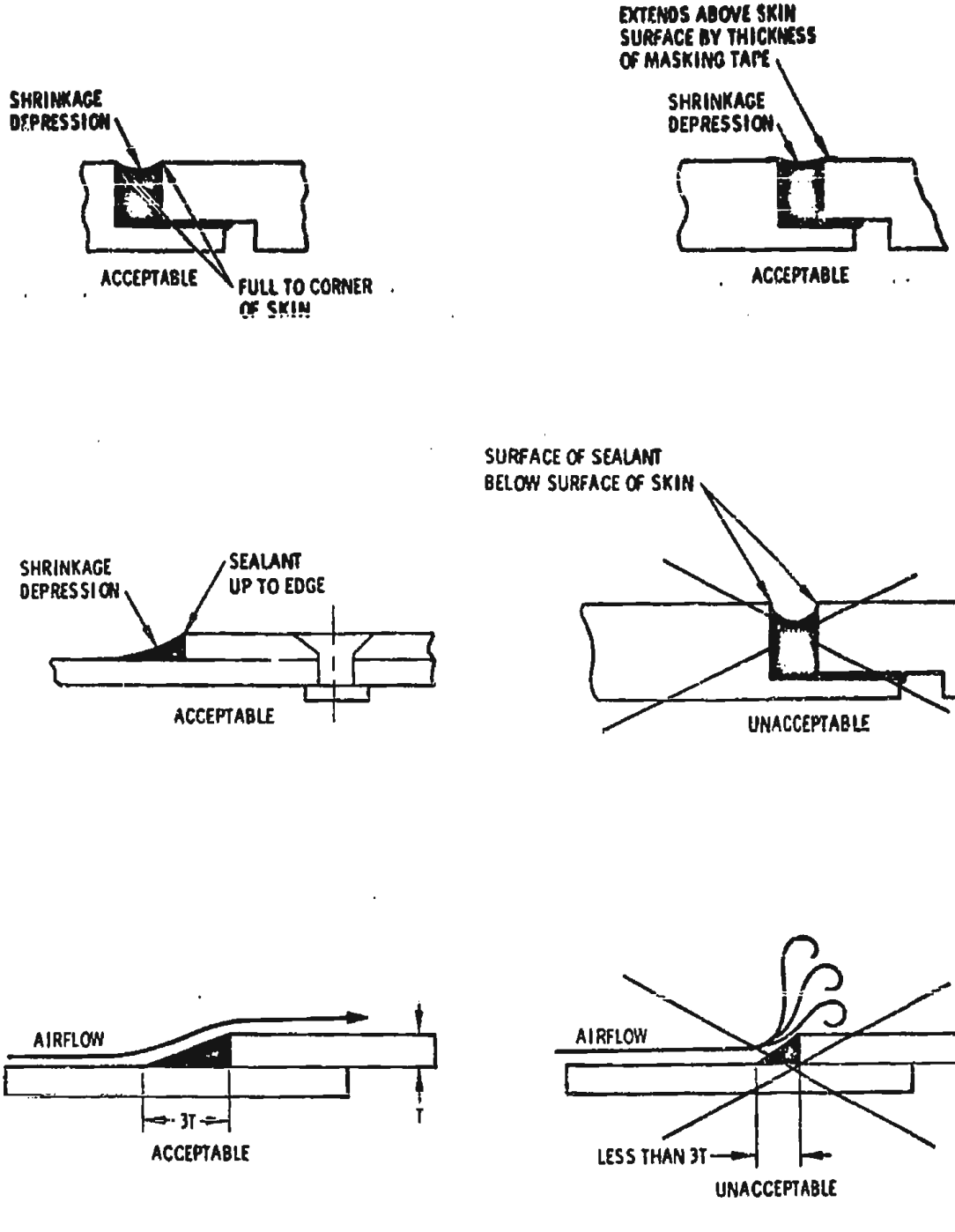
(b) Center engine support structure F.S. 2053 to F.S. 2151, not including aluminum fairing support angles extending from F.S. 2037.53, WL387.50 to F.S.2151 WL340.89.

(c) Right engine nacelle.

(d) Left engine nacelle.

NOTE: These requirements do not apply to titanium and other metal combination joints which are not included in sealing requirements.

(3) Fillet seal fuselage to outer wing mating joint at exterior intersections of upper attachment flange with



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R
R

Aerodynamic Smoothing and Fairing
Figure 202

EFFECTIVITY: ALL

001B

fuselage and lower leg of attach angle to upper wing skins using LCM140-2180 Type I sealing compound in addition to faying surface sealing.

(4) Sealing of Adhesive Bonded Joints

(a) Seal interior side of pressurized area, aft fuselage skins within pressurized area and aft body as outlined in Steps 4T(4)(b) through 4T(4)(d).

(b) Add additional coat of LCM37-1035 primer in areas other than designated critical corrosion areas to completely cover adhesive squeeze-out.

(c) Where crevices or edge voids in adhesive squeeze-out appear to extend to joint in areas other than designated critical corrosion areas fill with Fast Cure Surfaces (EPS37.7254), and cover with at least one coat of primer.

NOTE: Adhesive squeeze-out is considered to be a continuous bead immediately adjacent to joints extending approximately one-eigth to one-fourth inch from joint. Adhesive resin extending past this bead in form of runs or broken lines is not part of squeeze-out and does not need sealing.

(d) for following designated critical corrosion areas, apply fillet, spray or brush a coat of LCM40-2180 or LCM40-1218 approximately 0.025 inch beyond joints. Sealant must completely cover and extend 0.060 to 0.125 inch beyond adhesive squeeze-out after skins have been attached to stringers, longerons and ribs. Designated critical corrosion areas are as follows:

- FWD Lavatory and Service Center - FS227.5 to FS349 below WL240.

- Waste Storage Tank Area - FS282 to FS382 below WL200 on left side and below WL140 on right side.

- Ram Air Plenum Area - FS328 to FS378 below WL180.

- Water Separator and ECS Duct Area - FS387 to FS449 below WL190.

- FWD Cargo Compartment Area - FS449 to FS703 below WL125.

- Galley Area - FS703 to 943 below WL144.

- Electrical Service Area - 943 to FS983 below WL125.

- Center and Aft Cargo Compartment Area

  FS1363 to FS1480 below WL134

  FS1480 to FS1545 below WL200

  FS1545 to FS1725 below WL134.

- Aft Lavatory Area -

  FS1725 to FS1778 below WL134 on left side.

  FS1725 to FS1778 below WL200 on right side.

  FS1778 to and including aft pressure bulkhead below WL240.

- Area below cabin doors -

  FS846.25 to FS923 below WL200

  FS1480.25 to FS1545 below WL200

  FS1745 to FS1810 below WL200.

Aft Body Area - All band lines below MHB (Maximum Half Breadth).

(e) Seal bonded metal assemblies and parts other than those covered in Step 4T(4) according to following:

(f) Within fuselage skin and above WL125

- No special sealing required other than paint or primer coating called for by engineering drawing.

(g) Panels or Parts of Panels Below WL125

- Seal edges of banded areas by applying a coat of LCM40-2180 or LCM40-1218 sealant, about 0.025 inch thick, over adhesive squeeze out after LCM37-1035 primer or primer and topcoat have been applied.

(h) Parts of Wing and Empennage Leading and Trailing Edges, and Aircraft Control Surfaces

R • Seal adhesive seen from outside of aircraft
R with C-40-1279, LCM40-2180 or LCM140-1218 sealant.

R (i) Crushed Honeycomb Sandwich (Bondlite) Panels

R • Seal edges exposed to outside with a coat of
R C-40-1279 sealant.

R • Seal edges on inside of aircraft with
R LCM40-2180 or LCM40-1218 sealant.

R (j) Glue lines on exterior side of skin

R • Seal with C-40-1279 sealant. Completely cover
R and extend sealant one-sixteenth to one-eighth
R inch beyond adhesive squeeze-out.

R • Completely cover and extend sealant
R one-sixteenth to one-eighth inch beyond adhesive
R fillet squeeze-out and one-sixteenth to one-eight
R inch beyond edge of outer skin of lap joint (Ref.
R Fig. 203).

R (5) Sealing of Voids Along Mechanically Attached Stringers
R or Longerons to Skins

R (a) Fill voids on both sides with LCM40-2180 sealant.

R (b) Fill voids above stringers number 24 and 42 to
R WL219, fill only voids on upper edges of stringers
R and longerons.

R (c) Above WL219 seal only where inadequate sealant is
R squeezed out over fail safe straps.

R (d) Fill voids that exist between frames attachment
R and skin below WL219 on all sides with LCM40-2180
R sealant.

R (6) Sealing of Metal Identification Plates

R CAUTION: DO NOT USE ADDITIONAL SOLVENTS WHEN MIXING
R SEALANT.

R (a) Mix MIL-S-8802, Class B; LCM40-2180 Type I or
R LCM40-1218 Type I sealing compound base and
R accelerator in proportions recommended by
R manufacture.

R (b) Apply 0.005 to 0.015 inch thick layer of sealant
R on to both faying surfaces.

(c) Join surfaces immediately after applying sealing compound.

NOTE: A single layer of Scrim Fabric EPS22.4611 may be used between faying surfaces to ensure a uniform coating of adhesive.

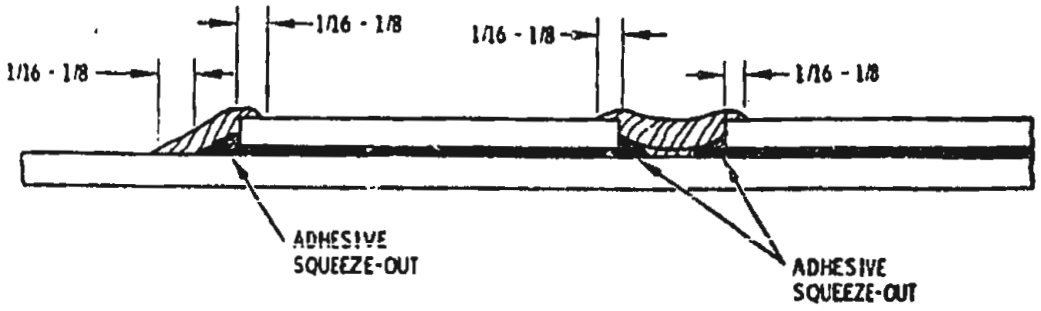
(d) Use enough pressure to maintain complete contact and cause a continuous bead of sealant to be squeezed out along joint edge.

(e) Maintain pressure until sealant develops handling strength.

(7) Fire Stop, Wing

(a) Seal fixed leading edge ribs on either side of engine pylon area (leading edge station 350 and 394 to 430) and trailing edge pylon area to make fire stop, using methods and materials for sealing integral fuel tanks. (Ref. MM28-11-00, 201).

(b) Seal wire bundles per Wiring Diagram Manual 20-21-00,201.



NOTE:

1 SEALANT MUST COMPLETELY COVER AND EXTEND 1/16 TO 1/8 INCH BEYOND ADHESIVE FILLET SQUEEZE-OUT AND 1/16 TO 1/8 INCH BEYOND EDGE OF OUTER SKIN OF LAP JOINT

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Lap Joint Sealing
Figure 203

R (c) Seal slits up to 0.20 by 0.50 inch long by
R injecting LCM40-2180 Type I sealant.

R (d) Seal direct gaps and holes larger than 0.20 by
R 0.50 inch by using wet-packed clips, back up
R plates or sealing cups.

R (e) Mechanically seal ducts, control cables or torque
R rods passing through ribs according to applicable
R engineering drawing.

R (8) Spar Caps to Web Joints of Empennage Surface Which Must
R Be Left Unattached At End For Assembly.

R (a) Confine original Faying surface sealant to areas
R where permanent fasteners are installed.

R (b) Seal final faying surfaces after final position is
R established during mating by injecting sealant
R into faying surfaces before fastener installation.

R (c) Fillet seal both sides of joint after assembly
R with LCM40-2180 Type I sealant (Ref.
R MM28-11-00,201).

R (d) Overlap original sealant squeeze-out by at least
R two inches.

R (9) Sealing of Floor Boards

R (a) Lay impregnated lacing tape MIL-T-43435 Type II,
R Finish C, Size 3 at base of gap leaving ends of
R tape above floor board level.

R (b) Fill rest of gap over lacing tape with EPS40.2470
R sealing compound leaving ends of tape accessible
R above sealant level.

R (10) Special Sealing of Lavatory and Galley Floor Structure

R (a) Solvent clean threshold hat section with O-T-620
R 1.1.1 Trichloroethane or other approved solvent.

R (b) Apply LCM40-2180 Type II sealant to horizontal and
R vertical legs of lavatory threshold hat section
R above 0.010 inch thick.

R NOTE: Do not apply sealant to tape of hat.

R (c) Apply LCM140-2180 Type II Sealant in areas around
R lavatory and galley to the upper surface of all

floor support structure containing floor attachments.

(d) Install silicone seal strips while sealant is wet by firmly pressing silicone strip edge against vertical leg.

NOTE: If a continuous bead of sealant is not squeezed out, remove strip and apply more sealant and reinstall.

(e) Install floor board with two or three screws for positioning.

(f) Brush coat remaining inserts around bead with LCM40-2180 Type II sealant, so sealant will cover countersink and enter hole.

(g) Overlap sealant on to floor board surface at least one-fourth inch.

(h) Install attaching screws while sealant is wet.

(i) Remove positioning screws.

(j) Apply sealant to inserts and reinstall screws.

NOTE: If aisle boards and lavatory boards are installed on two separate occasions perform Steps 4T(10)(a) through 4T(10)(j) individually on each side of hat section at time of board installation.

(k) Gap seal when board installation is completed (Ref. Step 4T(9).

(l) Inject LCM40-2180 Type I sealant into all gaps between lavatory partitions and floor on structure.

(m) Clean top of threshold hat section with O-T-620 1.1.1 Trichloroethane or other approved solvent.

(n) Apply tape, mylar, lavatory pan and hard covers according to applicable engineering drawing.

(o) Apply LCM40-2180 Type I sealant to floor area over hat section to receive threshold and filler strip while sealant is wet.

(p) Inject sealant under any loose floor cover edges in threshold area.

(q) Apply LCM40-2180 Type I sealant to underside of threshold strip.

(r) Install threshold and filler strip while sealant is still wet.

NOTE: If a continuous bead of sealant is not visible at all edges of theshold strip after installation remove strip, add sealant and reinstall.

(11) Sealing of Speaker and Chime Adapters to Ceiling Panels

(a) Lightly scuff sand exterior surface of adapters in area to be sealed.

(b) Wipe off residue with clean dry cloth.

(c) Attach adapter to ceiling panel and fasten.

(d) Solvent clean sanded area of adapter and adjacent plastic moisture barrier film around adapter where sealant will be applied.

(e) Dry thoroughly with a clean dry cloth.

(f) Apply a generous fillet of LCM30-2085 Type I adhesive all around joint formed by back (non decorative) surface of ceiling panel.

(g) Check gap between adapter and ceiling panel cut out to make sure gap is filled with adhesive.

U. Special Sealing for Severe Corrosion Environments

(1) Forward Lavatory and Service Center

(a) Seal Faying Surfaces and wet install fasteners or cabin floor structure and floor support, FS227-5 to FS349.

(b) Frames

- Seal faying surfaces, except parts attached to forward face, and wet install all fasteners at FS227.5 below WL240.

- Seal faying surfaces and wet install fasteners of all frames between FS222.5 and FS349 below WL240.

• Seal faying surfaces, except parts attached to aft face, and wet install all fasteners at FS349.

(c) Seal faying surfaces and wet install fasteners of stringer splice joints below WL240.

(d) Wet install fasteners penetrating pressure vessel and brush overcoat interior ends FS227.5 to FS349 below WL240.

(e) Seal faying surfaces and wet install fasteners of waste tank support structure.

(2) Battery Location

(a) Seal faying surfaces and wet install fasteners of airframe and supports between FS943 and FS983 and between LBL50 and RBL50.

(b) Wet install fasteners penetrating pressure vessel and brush overcoat interior ends between FS943 and FS983 and between LBL50 and RBL50.

NOTE: Seams, skin splices and fasteners located in structure under battery compartment, lavatories, galley, galley elevator and well, plus joggle recesses and corners of bilge area (area surrounded on lower fuselage by three stringers upward on either side of BL0.00) have a tendency to collect alkaline, acidic and phosphate ester fluids and are vulnerable to severe corrosion.

(3) Aft Lavatory

(a) Seal faying surfaces and wet install fasteners of cabin floor and supporting structure from FS1725 to and including pressure bulkhead.

(b) Seal faying surfaces (except parts attached to forward face) and wet install all fasteners of baggage floor support beam and bulkhead of FS1792.

(c) Seal faying surfaces and wet install fasteners of frames and stringer splice joints FS1725 to FS1778 below WL200 and FS1778 to FS1808 below WL240.

(d) Wet install fasteners penetrating pressure vessel and brush overcoat interior ends, FS1725 to FS1778 below WL240 right side and below WL240 left side,

FS1778 to and including aft pressure bulkhead below WL240.

(4) Forward Lavatory Waste Tank

(a) All structure under area covered by tank shroud as follows:

• Seal faying surfaces and wet install fasteners of frames and stringer splice joints, FS297 to FS328 canted bulkhead, LBL35 to RBL35, below WL171, including tank support structure.

• Wet install fasteners penetrating pressure vessel and overcoat interior ends, FS297 to FS328 canted bulkhead, LBL35 to RBL35, below WL171.

(5) Galley

R (a) Seal faying surfaces (except parts attached to forward face) and wet install fasteners of floor structure permanently attached at FS703 bulkhead below WL144.

(b) Seal faying surfaces and wet install fasteners of permanently attached side structure and floor structure, FS709 to FS923, below WL144.

(c) Seal faying surfaces except parts attached to aft face, and wet install all fasteners of floor structure and FS943,09 bulkhead below WL118.

(d) Wet install fasteners and brush overcoat interior ends of fail-safe frames and stringers and splice joints, FS703 to FS943.09 below WL144.

(6) Galley Lift and Food Service Center

(a) Seal faying surfaces and wet install fasteners of cabin floor structure, FS901 to FS943 between LBL47 and RBL47.

(b) Seal faying surfaces and wet install fasteners of lift well structure below WL236.

(7) Overcoating

WARNING: USE COATINGS IN WELL VENTILATED AREA. DO NOT

INHALE VAPOR, AND AVOID FLUID CONTACT WITH SKIN AND EYES. PROLONGED EXPOSURE MAY CAUSE DIZZINESS, SKIN OR EYE IRRITATION. KEEP AWAY FROM HEAT SPARKS AND OPEN FLAME. FAILURE TO COMPLY MAY RESULT IN MATERIAL COMBUSTION.

(a) Overcoat exposed fillet and brush sealant with EPS37.4598 protective coating in all severe corrosion areas and where sealant may be exposed to acids, alkalies, oils or offer corrosive fluids.

NOTE: Overcoating is not necessary on areas where sealant will be coated with C-37-1348 topcoat paint.

Typical areas that require overcoating are locations underneath toilets, galleys, battery compartments and bilge.

(b) Clean surfaces to which coating is to be applied by wiping clean with clean cloth dampened with TT-N-95 Aliphatic Naptha, LCM32-1087 cleaning solvent or O-T-620 Trichloroethane.

(c) Immediately wipe dry with clean cloth before solvent evaporates.

(d) Apply coating material, mixed in accordance with manufactures instructions by spraying or brushing to form a cured dry film, with a thickness between 0.5 and 1.0 mil.

NOTE: Protective coating may be applied over fresh sealing compound.

(e) Cover sealant completely and overlap a minimum of one-fourth inch. Allow coating to dry for approximately one-half (1/2) hour before handling.

NOTE: Overcoating must be free of pinholes, bubbles, voids or orange peel appearance. Coating must stick completely to surface.

R (f) Allow overcoating to fully cure by a seven day air dry before exposing to acidic, alkaline and phosphate ester fluids.

V. Post Sealing Requirements

(1) Post Sealing Clean Up

(a) After sealing compound has been applied and parts assembled, remove excess sealant [Ref. Step 4P(1)(d)].

(2) Curing of Sealing Compounds

(a) Cure at ambient temperature above 70 degrees Farenheit (21.11 degrees Centigrade) or cure at a accelerated temperature up to 135 degrees Farenheit, (57.22 degrees Centigrade) until a full cure, with full performance properties is obtained.

(b) Cure sealing compounds to a tack free condition before subjecting to cleaning fluids or pressurization.

(3) Protection of uncured sealants

CAUTION: UNCURED BRUSHABLE SEALANTS MUST REMAIN EXPOSED FOR A MINIMUM OF ONE-HALF HOUR BEFORE COVERING. DO NOT CONTAMINATE UNCURED SEALANT.

(a) To prevent contamination of chips, burrs, and other dirt, protection must be completed in one of the following ways:

• Coat exposed sealant with polyethylene film. Remove film when sealant has reached a tack-free condition, as evidenced by non-sticking of film to sealant.

• Coat exposed uncured sealant with protective coating material EPS 37.4598. Make coating about 0.0005 inch thick and allow to dry to a tack-free condition before drilling etc,.

NOTE: Uncured squeeze-out sealants may be covered immediately after application.

(b) Standard or Field Repair

• Where LCM40-2180 sealant is damaged, needs re-sealing or to seal with limited curing time, use quick-repair sealing compound LCM40-1218 Type I and II instead of LCM40-2180 to speed up curing.

NOTE: There are no quick-repair materials for other sealants.

R SEALING OF FIREWALLS - MAINTENANCE PRACTICES

R 1. General

R This procedure establishes the material and processes to be used
R for sealing the firewalls.

R 2. Equipment and Materials

R Methyl-Ethyl-Ketone: Open Vendor; Fed Spec P/N TT-M-261, or
R equivalent

R Cleaner, Petroleum Base; Leeder Chemical Co., FSCM17209 P/N
R 101KE; Lockheed P/N LCM32-1087, or equivalent

R Primer, For Firewall Sealing Compound; D. Aircraft Products Co.,
R DAPCO NO. 1-100 Primer

R Sealing Compound, Firewall (Flame, Phosphate Ester and Turbo Oil
R Resistant); Lockheed P/N C-40-1194; D. Aircraft Products Co.,
R DAPCOCAST NO. 18-4

R 3. Maintenance Practices

R A. Process Requirements

R All openings in the firewalls must be located by checking
R from both sides with a flashlight. If light can be seen
R from either side, the openings should be sealed on the
R engine side of the firewall using the following procedures.

R B. Cleaning

R WARNING: USE CLEANING SOLVENTS IN A WELL VENTILATED AREA.

R DO NOT INHALE VAPORS OR ALLOW CLEANING SOLVENTS TO
R CONTACT THE SKIN.

R KEEP CLEANING SOLVENTS AWAY FROM OPEN FLAME OR
R HEAT.

R CLEANING SOLVENTS ARE VOLATILE AND MUST BE KEPT IN
R AN AIR TIGHT SAFETY CAN. KEEP SAFETY CAN TIGHTLY
R CLOSED WHEN NOT IN USE.

R KEEP SOLVENT SOAKED RAGS FROM ACCUMULATING IN WORK
R AREA.

R (1) Surfaces where sealing compound is to be applied must
R be thoroughly cleaned with petroleum base cleaner or
R Methyl Ethyl Ketone just prior to the application of
R the sealant.

R C. Priming

R WARNING: USE PRIMER IN A WELL VENTILATED AREA.

R DO NOT INHALE VAPORS OR ALLOW PRIMER TO CONTACT
R SKIN.

R KEEP PRIMER AWAY FROM FLAME OR HEAT.

R PRIMER IS VOLATILE AND MUST BE KEPT IN AN AIR
R TIGHT SAFETY CAN. KEEP SAFETY CAN TIGHTLY CLOSED
R WHEN NOT IN USE.

R (1) After cleaning, prime the surface with primer. Allow
R primer to dry for a minimum of one hour. Surfaces that
R have been primed for more than 12 hours should be
R recleaned and reprimed.

R D. Mixing

R (1) The curing agent should be added to the base compound
R and thoroughly mixed in accordance with the
R manufactures instructions.

R E. Firewall Sealing

R (1) Gaps, cutouts and holes less than 0.25 by 0.25 inch.

R (a) Apply sealing compound approximately 0.125 inch
R thick over all gaps, cutouts and holes. After
R forcing sealant into opening, extend sealant out
R past edges of opening a minimum of 0.5 inch and
R taper thickness down at the sealant edges.

R NOTE: Care should be taken not to disturb sealant
R for 48 hours.

R (2) Gaps, cutouts and holes 0.25 by 0.25 inch or larger.

R (a) A metal patch of the same material as the firewall
R should be used to cover holes 0.25 by 0.25 inch or
R larger.

R (b) Where possible, the metal patch should extend 0.25
R inch over the hole and should be from 0.015 to
R 0.040 inch thick.

R (c) Clean and prime both faying surfaces.

R (d) Cover one faying surface with sealing compound
R 0.010 inch thick.

R (e) Press patch in place and apply a small fillet of
R sealing compound around the edge of the metal
R patch.

R (f) Metal patches covering holes larger than 1.5 by
R 1.5 inches must be installed using mechanical
R fasteners with the seams sealed by applying a
R small filet of sealing compound around the edge of
R the patch.

R (g) Repeat flashlight test to verify sealing operation
R is complete.

PRESSURE SEALING OF THE MODEL L-1011 AIRPLANE - PB75-436B

1. SCOPE

1.1 Scope. - This process bulletin establishes the requirements for sealing the pressurized fuselage of the L-1011 aircraft.

2. APPLICABLE DOCUMENTS

2.1 SPECIFICATIONS

Federal

TT-M-261	Methyl Ethyl Ketone
TT-N-95	Naphtha Aliphatic
O-T-620	1, 1, 1 Trichloroethane, Technical, Inhibited (Methyl Chloroform)

Lockheed

C-40-775	Compound, Sealing, Integral Fuel Tank
C-40-769	Compound, Sealing, Low Adhesion
C-40-778	Compound, Sealing, High Temperature Resistant, Quick Repair
C-40-779	Potting Compound, Synthetic Rubber, Catalyzed (for Electrical Connectors and Electric Systems)
LCM32-1087	Cleaner, Petroleum Base, For Primed Metals, Non-Photochemically Reactive
LCM40-2121	Compound Sealing, Corrosion Inhibitive Faying Surface, Extended Assembly Time
P-6818	Functional Test - Fuselage Pressure and Leakage Check

2.1 (continued)

LS10277 thru 79	Fitting, Seal Electrical Wiring Harness
LS10280	Spacers, Coiled, Electrical Wiring
LS10281-82	Spacer Star, Electrical Wiring
LS10283	Plate, Seal, Electrical Wiring
LS10284	Plate, Filler, Electrical Wiring
LS10285-86	Plate, Cover, Electrical Wiring

2.2 The following commercial materials, covered by the Engineering Purchasing Specification (EPS) Manual, form a part of this bulletin to the extent specified herein:

Material	EPS Number
Tubing, Heat Shrinkable, Kynar	22.2974
Tubing, Spooled Slit Adhesive Sleeve	22.2976
Adhesive and Sealant Tape (For Heat Shrinkable Parts)	30.0411
Primer, Sealant	40.0966
Protective Coating for Sealant	37.4598

3. REQUIREMENTS

3.1 Material requirements. - Only those materials specified herein shall be used in the process covered by this process bulletin.

3.2 General requirements

3.2.1 The requirements for pressure sealing shall be as follows:

(a) Permanent seams, flanges and splice joints forming the pressure vessel, shall be sealed in the faying surfaces during assembly and fi-let sealed after assembly as specified herein.

(b) Holes, gaps, joggles, wire bundle and plumbing line openings, through which air can leak, shall be wet packed or injection sealed as specified herein.

(c) Structure common to pressure compartment and center wing box shall also be vapor sealed on the pressure side as specified herein.

3.2.2 Processing area. - For optimum results, the application of sealing compounds shall be accomplished in an area where the temperature is between 60 and 100°F and the relative humidity is between 20 and 85 percent.

CAUTION: Sealants, whether regular or quick repair, may not cure properly below 60°F or 20 percent humidity.

3.2.3 Handling and storage of sealing compounds. - Containers of freshly mixed sealing compounds shall be marked to identify the Material Specification and class of sealant.

Two part sealing compounds may be pre-mixed and quick frozen in containers sealed to prevent the entry of contamination media and stored at -20°F or below. Containers shall be marked to identify the Material Specification, class, date of mixing, material manufacturer and batch number.

Pre-mixed and frozen sealant must be thawed to a temperature of 60°F or to a temperature above the dew point if it is above 60°F. Quick freezing shall be defined as follows:

Quick Frozen - A condition where the sealant temperature is reduced from ambient to -20°F or below within 10 minutes.

3.2.3.1 Sealants may also be purchased in cartridges, premixed and frozen by the vendor, and labeled as described in 3.2.3. They shall be stored at -20 F or below.

3.2.4 Machining and fitting of parts. - Where practicable, drilling, deburring, and fitting of parts shall be completed prior to the surface preparation and application of sealing compound. However, where fasteners are installed on automatic fastening machines or where interference fit fasteners are used and parts cannot be disassembled after drilling of holes, the detail parts shall be cleaned in accordance with 3.2.5, sealant applied, parts clamped together, holes drilled and fasteners installed.

3.2.5 Surface cleaning. - Sealing compounds shall be applied to surfaces which have been thoroughly cleaned by wiping with clean rags dampened with O-T-620 Trichloroethane or LCM32-1087 cleaning solvent. Prior to solvent evaporation, the surface shall be dried by wiping with clean rags.

3.2.6 Application of sealing compound. - After the surface has been cleaned, sealing compound shall be applied and parts shall be assembled and fastened within the application and assembly times specified in Table I.

TABLE I - APPLICATION, ASSEMBLY, AND CURE TIMES OF SEALING COMPOUNDS (1)

Sealing Compound	Times in Hours					
			Approximate Cure Times			
				Accelerated Cure (2)		
	Appl. Limit	Assy. Limit (Includes Appl)	Std. Cure 75 ±10°F	At 75 ±10°F	plus	At 125 ±10°F
C-40-775 Type I, II and III	2	2	72	1/2	plus	3
C-40-778 Type I and II	1/4	1/4	24	1/2	plus	1
LCM40-2121						
B12/S12	12	20	240	24	plus	24
B24/S24	12	80	480	24	plus	48
B48	12	120	1000	24	plus	64
S40	12	120	1000	24	plus	64
C-40-769						
Type I	1/2	1/2	24			
Type II	3	3	24			

NOTES:

(1) The application and assembly limits of the sealing compound are maximum for ambient conditions of temperatures up to 95°F and 50 ±5 percent relative humidity. Higher temperatures or humidity will decrease the application and assembly limits. Low temperatures (below 60°F) or humidity (below 20%) may prevent sealant from curing properly.

(2) Accelerated cure shall consist of curing at 75 ±10°F for hours noted followed by curing at 125 ±10°F for hours noted. If assemblies with sealed faying surfaces have been allowed to cure at room temperature for two or more days, the number of hours at accelerated curing temperature may be reduced. Example: LCM40-2121, B12-2 days at RT + 6 hours at 125 ±10°F.

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3.3 Detail requirements

3.3.1 Pressure sealing of permanent joints

3.3.1.1 Faying surface sealing. - Permanent seams, splice joints, and flanges forming the pressure vessel of the fuselage shall be sealed in the faying surfaces during assembly. This shall be accomplished using LCM40-2121 sealant. Strikers and mechanical seal retainers shall be wet packed on installation. Splices in strikers and retainers shall be filled with C-40-775, Type I sealant and carefully faired to maintain the contour of the part.

NOTE: If LCM40-2121 Type S is used for sealing of faying surfaces, allow a minimum of 30 minutes for solvent flash-off prior to assembly of mating parts.

3.3.1.1.1 The sealing compound shall be applied to completely cover the surface of the doubler or one of the mating flanges, in sufficient quantity to fill the faying surface gap. After assembly, a continuous extruded film of sealant on all edges of the joint shall be verified by inspection and the excess (globs, heavy beads, runs etc.) shall be removed. Fasteners shall be wet installed within the assembly time of the sealing compound. Where this is not possible, temporary screw type fasteners, in every third hole and at the ends, shall be used to pull the joints together until permanent fasteners can be installed.

3.3.1.1.2 Faying surface sealing of the internal members of splice joints above W. L. 199.5 is not required where the splice is covered by an external girth strap which is faying surface sealed on installation.

3.3.1.2 Fillet and injection sealing. - Fuselage mating joints and unbonded skin splices which must contain pressurized air shall be fillet sealed on the pressure side of the joint. Holes, gaps and slots created by plumbing lines penetrating pressure bulkheads and leak paths occurring at intersections of bonded fail safe straps and splice plates shall be fillet and injection sealed. Areas to be sealed shall be cleaned to remove chips and dirt. Slits up to 0.20 inches wide may be injection sealed, but gaps or corner holes exceeding 0.20 inches shall utilize clips, back up plates or sealing cups which shall be wet packed.

Unbonded doublers, triplers, door and windshield frames and window forgings shall be faying surface and fillet sealed. Small parts or parts which require sealant to fill open space in the faying surface shall be pack sealed with fillet material C-40-775 Type I. Large parts shall be fay surface sealed with LCM40-2121 and fillet sealed with C-40-775 Type I. Fillet dimensions shall conform to diagram A.

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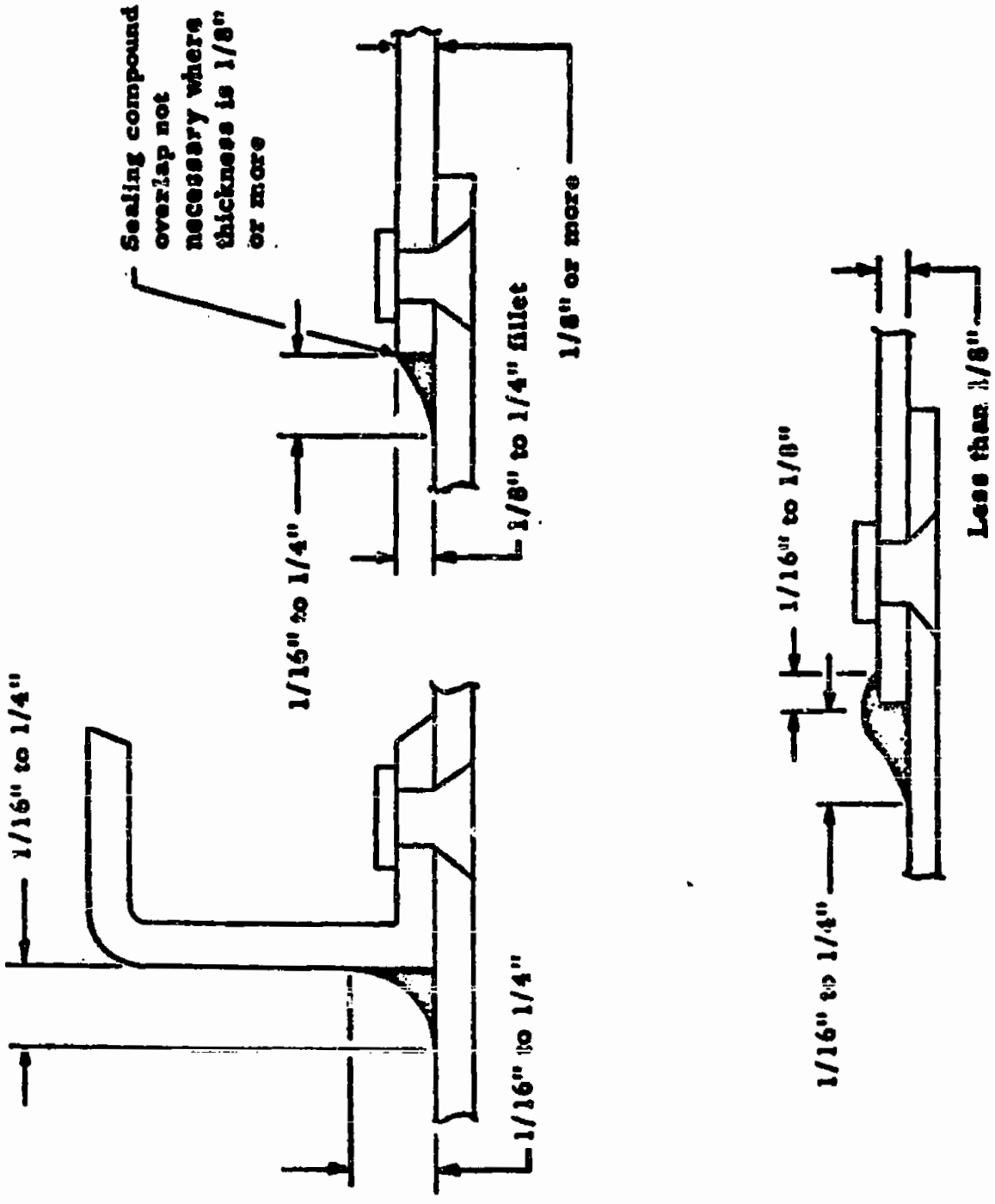
Sealing compound overlap not necessary where thickness is 1/8" or more
1/8" or more
1/8" to 1/4" fillet
1/16" to 1/4"
1/16" to 1/4"
1/16" to 1/4"
1/16" to 1/8"
Less than 1/8"
1/16" to 1/4"

DIAGRAM A - POST-ASSEMBLY FILLET SEALS

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3.3.1.3 For in process sealing of voids or channels created by assembly of parts, the voids may be sealed either by (a) wet packing with C-40-775 Type I sealant while parts are being assembled or by (b) injecting with this sealant immediately after the parts are assembled, while the area is free of chips and dirt and while faying surface sealant is still fresh, until void is completely filled. Do not drill in the vicinity of sealant until cured or covered to protect from chip embedding.

3.3.1.4 All electrical wires and wire harnesses penetrating pressure bulkheads shall be sealed to provide a pressure tight seal.

3.3.1.4.1 Detail sealing procedure. (See Figure 1.)

3.3.1.4.1.1 The preferred method of sealing wire bundles is to seal the bundle and install the pressure bulkhead fitting on the wire harness before installation in the bulkhead.

3.3.1.4.1.2 Determine the location where the bundle will pass through the pressure bulkhead and remove any harness ties located within 12 inches of either side of the location where the bulkhead seal fitting will be installed (LS10277, LS10278, or LS10279, as specified by the Engineering drawing or wire card). Spare wires, as required by drawing or wire card, should be located around the outer periphery of the bundle with their ends staggered one from the other.

3.3.1.4.1.3 Spread the wires and clean both the wires and the required seal fitting in accordance with 3.2.5.

3.3.1.4.1.4 Wire conforming to Material Specification C-01-1185B (white color) shall be primed using Primer (E P S 40.0966) over the length to be potted (approximately 2 inches) and allowed to air cure for a minimum of 1 hour. Care shall be taken to assure the primer is not contaminated during the cure cycle. Wire conforming to Material Specification C-01-1185C and subsequent (mustard color) does not require priming.

3.3.1.4.1.5 The wire bundle shall be sealed into the bulkhead fitting by either Method 1 or Method 2 below.

METHOD 1

(a) Apply a liberal amount of C-40-779 Type I potting compound, using a brush to spread the sealant over the length of wire to be potted (approximately 2 inches) so that the sealant will completely coat the wires. C-40-779 Type II potting compound may be used where the sealant can be applied and the wire bundles secured within 15 minutes after the sealant is mixed.

(b) Carefully squeeze the wires together, completely filling the space between the wires with the potting compound. The resulting bundle seal shall have all wires completely coated with sealant, free of voids, and any sealant which may have run onto wires beyond the potted area shall be removed prior to sealant cure. Replace any wire bundle ties which may have been removed.

(c) Install the plastic bulkhead fittings by wet packing with LCM40-2180 Type I sealant. The wire bundle should be approximately centered within the fitting and any excess sealant squeeze-out removed. Tape or other suitable material may be used to secure the two bulkhead fitting halves and contain the sealant until the material is cured. Remove excess sealant prior to cure. Cure for a minimum of 18 hours at room temperature before handling the parts. If the parts can be heated, cure may be accelerated by heating to temperatures up to 140°F after standing for approximately 1/2 hour at room temperature to allow solvent flash-off. The actual length of time will depend upon the temperature and humidity.

NOTE: Large diameter wires, widely spaced, may be sealed directly into the plastic fittings with LCM40-2180 Type I sealant.

METHOD 2

(a) Select shrinkable tubing (EPS 22.2974) whose recovered diameter is approximately the same as the wire bundle to be sealed and approximately the length of the bulkhead seal fitting to be used. Tubing must be slipped over wire bundle prior to the addition of connectors or other devices which might prevent placement of the tubing on the area to be sealed.

(b) Fit each individual wire of the bundle with the correct size SSAS sleeve (EPS 22.2976) cut to the same length as the tubing. Individual wires of twisted, unshielded, unjacketed multiconductor cable must be unwound in the seal location and fitted with SSAS sleeves.

METHOD 2 (Continued)

(c) Wrap the bundle over the adhesive sleeves with two layers of tape adhesive (EPS 30.0411). The adhesive may be tacked in place by fusing the outer end with a soldering iron.

(d) Slide the shrinkable tubing over the adhesive bundle and heat with a heat gun until the sleeving is recovered and all the adhesive material flows and fuses together with the wires, so that the wire bundle is completely sealed.

(e) Wind additional tape adhesive (EPS 30.0411) sufficient to provide a snug fit inside the bulkhead seal fitting. Tack the tape adhesive as in (c) above.

(f) Heat the entire assembly to thoroughly soften the tape adhesive. Immediately clamp the split bulkhead seal fitting over the softened adhesive so that the two shell halves are firmly mated and excess adhesive is squeezed from the ends. The bulkhead seal fitting shall be held together with plastic tie wraps or other suitable clamping means until the assembly cools and the adhesive solidifes.

(g) Inspect the assembly for continuous holes through the adhesives or other voids. If any are found, re-heat the assembly as above, and squeeze the fitting until the adhesive flows into the fills all voids. Be certain that the bulkhead fitting joint seam and injection holes are completely sealed.

(h) Replace any wire bundle ties which may have been removed.

3.3.1.4.2 Assemble and seal the wire bundles and fittings to the pressure bulkhead. (See Figure 2.)

3.3.1.4.2.1 Install the wire harness into the pressure bulkhead so that the flange of the plastic seal fitting is located on the pressure side of the bulkhead seal plate. Faying surface seal the bulkhead seal plates (LS10283, LS10284, LS10285/86 as required) with LCM40-2180 Type II or LCM40-2121. If the LCM40-2121 compound is used, the squeeze-out must be removed. Faying surface seal the plastic seal fittings, filler plates, and cover plates (if required), to the seal plate with LCM40-2180 Type I. Fillet seal all seams of the assembly with LCM40-2180 TYpe I; brush coat all fastener heads with LCM40-2180 Type II. All sealant fillets shall be smooth so as to present a neat appearance to the entire installation.

3.3.1.4.2.2 Where more than one bundle of wires penetrate the pressure bulkhead assembly and seal as shown in Figure 1.

3.3.2 Vapor and pressure sealing center wing box

3.3.2.1 Faying surface seal all attachments to the external side of the front beams, front beam web, and top skin side of the center wing box. All panel splice seams shall be fillet sealed. All fastener heads shall be sealed by brush coating in these areas. Repairs may be made by spraying the fastener heads with C-40-775, Type III Sealing Compound.

3.4 Post sealing requirements

3.4.1 Sealant cleanup. - After assembly, the excessive sealing compound shall be removed by wiping with a clean rag dampened with O-T-620 Trichloroethane or LCM32-1087 cleaning solvent. However, if possible, areas around acrylic windows and surfaces made of plastic, reinforced plastic or finished with an organic coating shall be cleaned with TT-N-95 Type II Aliphatic Naphtha. During cleanup, care shall be exercised to prevent cleaning solvents from coming in contact with any uncured sealing compound.

3.4.2 Protection of uncured sealant. The uncured sealant shall not be contaminated. Uncured extrudable sealants may be covered immediately after application. Uncured brushable or sprayable sealants shall remain exposed for a minimum of 1/2 hour before covering. Protection may be accomplished in one of the following ways to preclude contamination with chips, burrs, and other dirt.

3.4.2.1 The exposed uncured sealant may be overcoated with polyethylene film. The film shall be removed when the sealant has reached a tack-free condition as evidenced by the non-adherence of the film to the sealant.

3.4.2.2 The exposed uncured sealant may be overcoated with a protective coating material (EPS 37.4598). This coating shall be approximately 0.0005 inches thick and shall be allowed to dry to a tack free condition prior to drilling, deburring, etc.

M1-0100-20-687

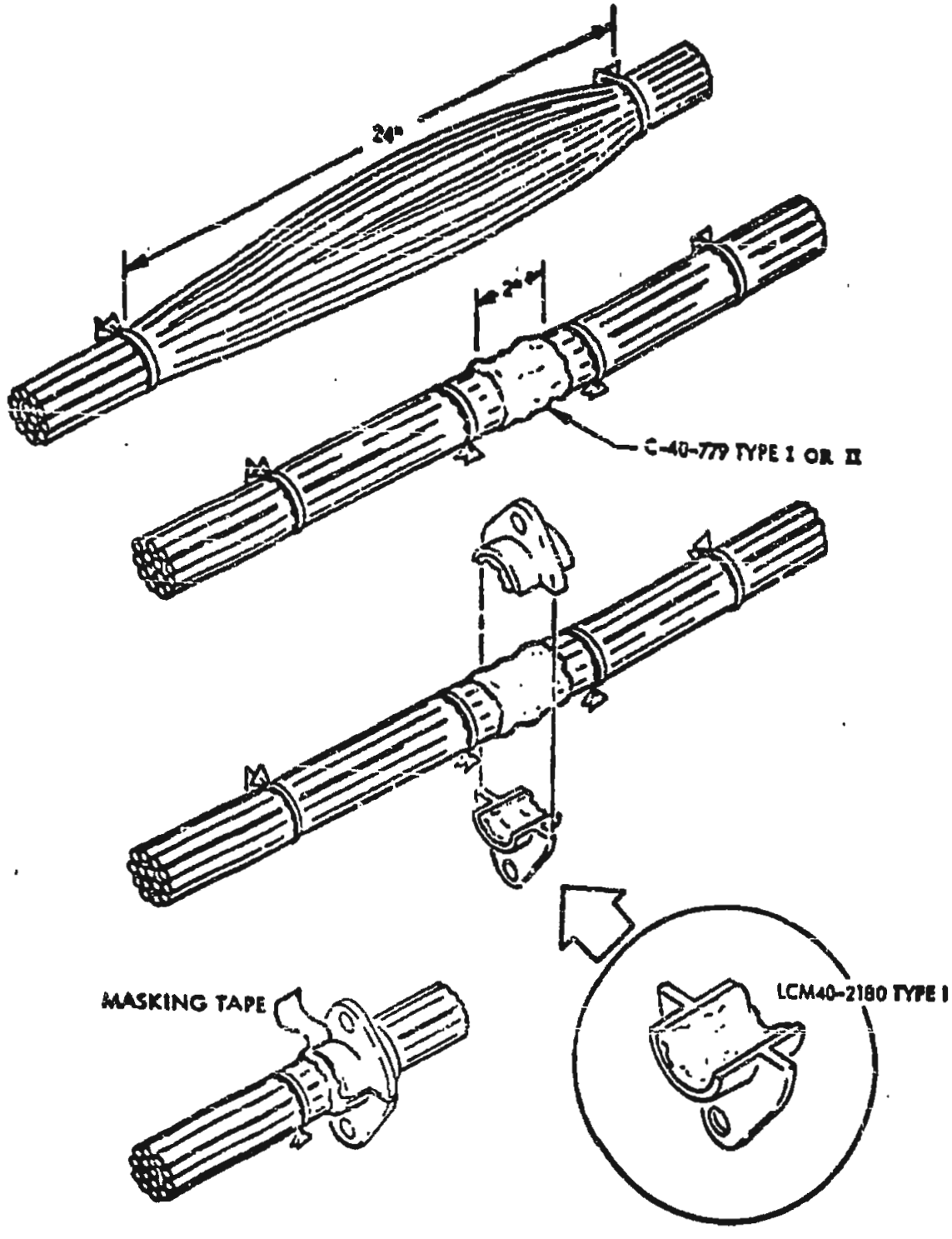

FIGURE 1

M1-0100-20-668

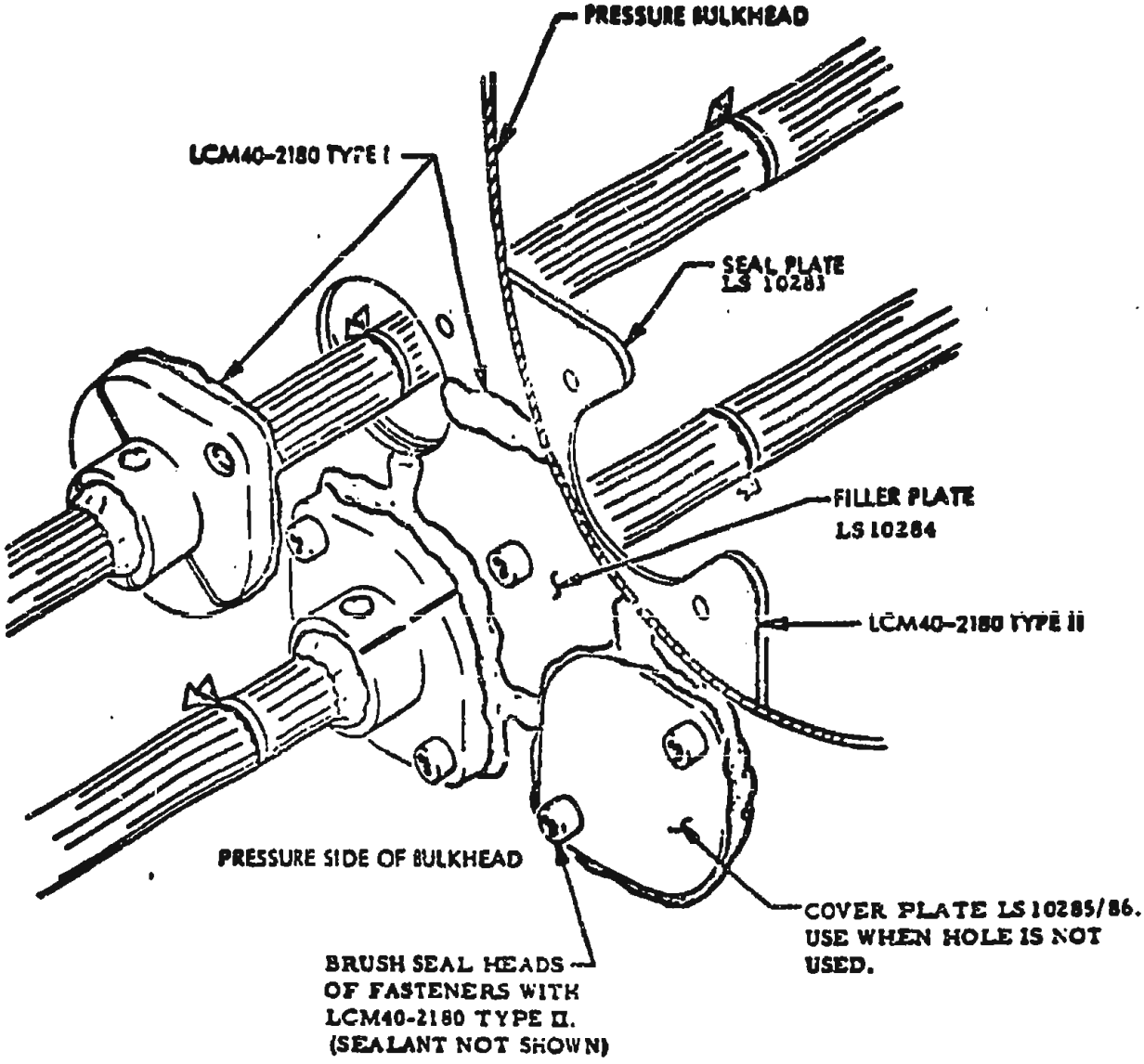
PRESSURE BULKHEAD
LCM40-2180 TYPE I
SEAL PLATE LS 10283
FILLER PLATE LS 10284
LCM40-2180 TYPE II
PRESSURE SIDE OF BULKHEAD
COVER PLATE LS 10285/86. USE WHEN HOLE IS NOT USED.
BRUSH SEAL HEADS OF FASTENERS WITH LCM40-2180 TYPE II. (SEALANT NOT SHOWN)

FIGURE 2

M1-0100-20-689

3.4.3 Curing of sealing compounds. - Sealing compounds may be cured either at ambient conditions above 60°F, or accelerated heat curing at temperatures up to 135°F until a full cure, possessing full performance properties is attained. Except for cleanup of excessive sealant, the compound shall be completely cured before being subjected to cleaning fluids in pressurization. Refer to Table I.

3.5 Workmanship. - Personnel performing faying surface sealing operations in accordance with this specification shall be qualified sealers possessing certification as having proficiency adequate to ensure compliance with the requirements herein.

3.6 Functional test requirements

3.6.1 The resulting sealing shall suffice to retain pressurized air within the limits prescribed by the Functional Test Document P-6818. The use of dummy windows and doors are not permitted in obtaining final pressurization.

3.6.2 In-process repairs. - Where whistling holes indicate a deficiency in the sealing of the pressure vessel, repairs shall be effected by using the quick repair C-40-778 Type I sealing compound.

4. QUALITY ASSURANCE PROVISIONS

4.1 Sufficient surveillance shall be exercised to ensure compliance with the requirements of this specification.

5. HANDLING/STORAGE - Not applicable

6. NOTES

6.1 There is no government specification covering the requirements of this process bulletin.

6.2 The requirements for all environmental sealing, including severe corrosion environments, are contained in PB75-425.

6.3 This revision supersedes PB75-436A dated 1-27-70 and Amendment #1 dated 7-3-69.

M1-0101-20-690

R APPLICATION OF INTUMESCENT PAINT - MAINTENANCE PRACTICES

R 1. General

R This procedure establishes the requirements for field
R application of intumescent paint with epoxy primer overcoat to
R titanium and aluminum components. The procedure will provide
R adequate cure of the paint to meet specifications, except
R phosphate ester fluid (hydraulic fluid) penetration. This
R parameter will be attained in a matter of hours; actual length
R of time is dependent on temperature. The thickness of the
R components of the coating system may be determined with a
R micrometer or equivalent measuring device on painted parts.

R 2. Equipment and Materials

R Xylene, Federal Spec TT-X-916 Methyl-Ethyl-Ketone, Federal Spec
R TT-M-261

R Cleaner, Petroleum Base, Non Photochemically Reactive, PN
R LCM32-1086, or equivalent

R Primer Coating Epoxy, Phosphate Ester Resistant, PN LCM37-1035,
R or equivalent

R 3. Intumescent Paint Application

R WARNING: ALL PRECAUTIONS NORMALLY USED IN MIXING AND APPLYING
R ORGANIC COATINGS MUST BE OBSERVED. AVOID PROLONGED
R BREATHING OF VAPORS OR CONTACT WITH SKIN. DO NOT USE
R NEAR OPEN FLAMES OR SPARKS. ALWAYS WASH HANDS
R THOROUGHLY BEFORE EATING.

R A. Surface Preparation

R (1) All surfaces to be painted must be either hand-abraded
R using 180 grit paper, or abrasive-blasted using 120
R aluminum oxide grit.

R (2) Parts which have been abrasive-blasted must be rinsed
R with tap water, applied under pressure through a needle
R spray nozzle to dislodge any contamination from the
R surface, then dried in an oven at 150-160 degrees F for
R one hour. Do not allow solvent to dry on the surface.

R (a) An alternate method of removing residue is by
R blowing with clean air through a spray nozzle.
R This must be followed by wiping with a clean

lint-free cloth with petroleum cleaner or methyl-ethyl-keytone. Immediately wipe surface dry with a clean, dry, lint-free cloth.

B. Application

(1) The intumescent paint may be applied by brush or spray application.

NOTE: For spray application, the paint must be thinned with Xylene to 30-35 seconds zahn cup No. 2.

(2) Apply the paint as a wet film to the surface; 6-8 mils (wet) per coat with 8-10 minutes heat lamp dry between coats is recommended.

(3) Apply enough coats to build up a total dry film thickness of 30 mils. Recommended heat lamp temperature at the paint surface is 150 - 200 degrees F.

(4) Apply two wet coats of primer seal to a total dry film thickness of 1.0 - 1.5 mils with ten-minute heat lamp dry (each coat).

(a) The primer must be applied in a manner that the resulting finish is free from grit, seeds, streaks, blisters, pinholes, or any other surface irregularity.

C. Repair

Minor scratched and damaged areas can be repaired or touched-up by sanding, cleaning, and reapplying the coating by brush.

R R TOUCH UP REQUIREMENTS FOR FINISHES
MAINTENANCE PRACTICES

R 1. General

R This procedure establishes requirements for touchup of damaged
R finishes and areas where the finish has been omitted.

R 2. Equipment and Materials

R Methyl-Ethyl-Ketone: Open Vendor; Fed. Spec. TT-M-261; or
R equivalent.

R Chemical Conversion Materials, Colored, For Aluminum Alloys:
R Amchem Products Inc., (FSCM 84063), P/N Alodine 1200S;
R MIL-C-81706 Class 1A; or equivalent.

R Chemical Film Materials, Clear, For Clad Aluminum: Amchem
R Products Inc., (FSCM 84063), P/N Alodine 1000; MIL-C-81706 Class
R 3; or equivalent.

R Compound, Sealing, Integral Fuel Tank: Products Research Co.,
R (FSCM 21940), P/N PR7401; Lockheed P/N LCM40-2180; or
R equivalent.

R Compound, Corrosion Protective Coating: Products Research Co.,
R (FSCM 21940), P/N PR1062 Type II; Lockheed P/N C-40-668 Type II;
R or equivalent.

R Coating, Aluminum Filled Ceramic, Air Dry, Touch-up: Teleflex
R Inc., (FSCM 78710), P/N Sermetel 196; Lockheed P/N 37.5482; or
R equivalent.

R Polyurethane Paint: Sherwin Williams Co., (FSCM 54636), P/N
R Polane T-F63-(SERIES); Lockheed P/N 37.7070; or equivalent.

R Intermediate Primer, Polyurethane Coating System: Sterling
R Lacquer Mfg. Co., (FSCM 60003), P/N U-1990; Lockheed P/N
R C-37-1103 Type II; or equivalent.

R Gloss Topcoat, Polyurethane Coating System: Sterling Lacquer
R Mfg. Co., (FSCM 60003), P/N U-(SERIES); Lockheed P/N C-37-1103
R Type III; or equivalent.

R Tape, Paper, Pressure Sensitive: 3M Co., (FSCM 52156), P/N 250;
R Lockheed P/N 24.1520; or equivalent.

R Remover, Epoxy and Polyurethane Paint: Turco Products Co., (FSCM
R 61102), P/N T5873; Lockheed P/N 32.2350; or equivalent.

R Cloths, Lint Free.

R Abrasive Paper, 320 Grit.

R 3. Surface Preparation

R A. All surfaces will be clean and free of contaminants prior to
R touch up.

R B. Painted Surfaces

R WARNING: USE M.E.K. IN WELL VENTILATED AREA. AVOID FLUID
R CONTACT WITH SKIN AND EYES. PROLONGED EXPOSURE
R MAY RESULT IN SKIN OR EYE IRRITATION. KEEP AWAY
R FROM HEAT, SPARKS AND OPEN FLAME. FAILURE TO
R COMPLY MAY RESULT IN MATERIAL COMBUSTION.

R (1) Painted areas around damaged or unpainted surfaces will
R be feathered in, using 320 grit abrasive paper,
R followed by wiping with Methyl-Ethyl-Ketone (MEK).

R (2) Wipe dry with clean cloths and apply touch up coat
R within 48 hours.

R WARNING: USE STRIPPER IN WELL VENTILATED AREA. AVOID FLUID
R CONTACT WITH SKIN OR EYES. EXPOSURE MAY RESULT IN
R SKIN OR EYE IRRITATION. KEEP AWAY FROM HEAT,
R SPRAKS AND OPEN FLAME. FAILURE TO COMPLY MAY
R RESULT IN MATERIAL COMBUSTION.

R (3) Acid paint strippers may be used on large areas, except
R on high strength steel above 180 ksi, plastic parts,
R faying surfaces and titanium, to remove damaged
R coatings prior to touchup.

R (4) Coatings on high strength steels will be removed by
R mechanical means or non-acid strippers only.

R C. Unpainted Surfaces

R WARNING: USE M.E.K. IN WELL VENTILATED AREA. AVOID FLUID
R CONTACT WITH SKIN AND EYES. PROLONGED EXPOSURE
R MAY RESULT IN SKIN OR EYE IRRITATION. KEEP AWAY
R FROM HEAT, SPARKS AND OPEN FLAME. FAILURE TO
R COMPLY MAY RESULT IN MATERIAL COMBUSTION.

R CAUTION: DO NOT SAND UNPAINTED METAL.

R (1) Clean bare metal areas by wiping with
R Methyl-Ethyl-Ketone (M.E.K.).

R (2) Wipe dry with clean cloths.

R 4. Touchup of Finishes

R A. When touchup is required on a particular finish, material
R used will be same as original or equivalent.

R B. Touchup may be accomplished by brush or spray application.

R C. Keep amount of material applied and area covered to a
R minimum.

R D. Touchup painting may be performed at locations other than at
R a paint hangar, such as flight line, providing atmospheric
R conditions are acceptable as follows and all other
R requirements are met:

R (1) All painting will be on a surface free of precipitation
R or condensation with a minimum of airborne dust and
R dirt particles.

R (2) Wash primer will be applied at a temperature of 70
R degrees Fahrenheit (21.1 degrees centigrade) minimum
R and a relative humidity of 20 to 80 percent.

R (3) Curing of wash primer will be accomplished at a
R temperature of 65 to 90 degrees Fahrenheit (18.1 to
R 32.2 degrees centigrade) and a relative humidity of 20
R to 80 percent for a minimum of 30 minutes and a maximum
R of 24 hours prior to application of intermediate
R primer.

R (4) Intermediate primer and topcoat will be applied at a
R temperature of 60 degrees Fahrenheit (15.5 degrees
R centigrade) minimum and a relative humidity of 20 to 80
R percent.

R (5) Curing of intermediate primer prior to application of
R topcoat will be 1-1/2 to 24 hours at 65 degrees
R Fahrenheit (18.1 degrees centigrade) minimum with a
R relative humidity of 20 to 80 percent.

R NOTE: Maintaining a continuous temperature and
R humidity in this range is not required. Time
R may be determined on a cumulative basis.

R (6) Topcoat will be cured at a temperature of 65 degrees
R Fahrenheit (18.1 degrees centigrade) minimum with a
R relative humidity of 20 to 80 percent for a minimum of
R 24 hours prior to flight.

R NOTE: Time may be cumulative.

R E. Aluminum surfaces with anodic or chemical film finish.

R (1) Colored chemical film treatment:

R (a) Material used for colored chemical films will
R conform to MIL-C-81706, Class 1A.

R (b) Prepare and control film solution in accordance
R with instructions furnished by supplier.

R CAUTION: DO NOT ALLOW SOLUTION TO DRY ON PARTS.

R WARNING: USE CHEMICAL FILM IN WELL VENTILATED AREA.
R DO NOT INHALE VAPOR, AND AVOID FLUID CONTACT
R WITH SKIN AND EYES. PROLONGED EXPOSURE MAY
R RESULT IN LUNG, SKIN OR EYE IRRITATION.

R (c) Brush apply solution evenly and liberally to wet
R surface thoroughly.

R (d) When perceptible golden color develops,
R immediately rinse thoroughly with cold water.

R (2) Clear chemical film treatment:

R (a) Material used for clear chemical films will
R conform to MIL-C-81706, Class 3.

R (b) Prepare and control film solution in accordance
R with instructions furnished by supplier.

R CAUTION: DO NOT ALLOW SOLUTION TO DRY ON PARTS.

R WARNING: USE CHEMICAL FILM IN WELL VENTILATED AREA.
R DO NOT INHALE VAPOR, AND AVOID FLUID CONTACT
R WITH SKIN AND EYES. PROLONGED EXPOSURE MAY
R RESULT IN LUNG, SKIN OR EYE IRRITATION.

R (c) Brush apply solution evenly and liberally to wet
R surface thoroughly.

R (d) Reapply solution as necessary to maintain a wet
R surface.

R (e) Allow solution to remain on surface in accordance
R with one of the following:

R • Six minutes at 50 to 70 degrees Fahrenheit (10
R to 21.1 degrees centigrade).

R • Five minutes at 70 to 90 degrees Fahrenheit
R (21.1 to 32.2 degrees centigrade).

R • Four minutes at 90 to 100 degrees Fahrenheit
R (32.2 to 37.7 degrees centigrade).

R (f) Thoroughly rinse part with cold water upon
R completion of applicable cycle.

R NOTE: Touchup of anodic or chemical film finishes
R is unnecessary on:

R • Interior drilled, punched or countersunk
R holes in aluminum alloys.

R • Exterior holes which have permanently
R wet-installed fasteners.

R • Cut or flared edges of aluminum alloy
R plumbing line tubing.

R F. Bare metal areas.

R WARNING: USE PRIMER IN WELL VENTILATED AREA. DO NOT INHALE
R VAPOR, AND AVOID MATERIAL CONTACT WITH SKIN AND
R EYES. PROLONGED EXPOSURE MAY RESULT IN SKIN, EYE
R OR MUCOUS MEMBRANE IRRITATION. KEEP AWAY FROM
R HEAT, SPARKS AND OPEN FLAME. FAILURE TO COMPLY
R MAY RESULT IN MATERIAL COMBUSTION.

R (1) Primed surfaces, showing bare metal areas resulting
R from holes, cut edges, scratches, etc., will be touched
R up with primer, unless subsequently overcoated with
R sealant.

R WARNING: USE TOPCOAT IN WELL VENTILATED AREA. DO NOT
R INHALE VAPOR AND AVOID FLUID CONTACT WITH SKIN AND
R EYES. PROLONGED EXPOSURE MAY RESULT IN
R UNCONCIOUSNESS OR LUNG, SKIN OR EYE IRRITATION.
R KEEP AWAY FROM HEAT, SPARKS AND OPEN FLAME.
R FAILURE TO COMPLY MAY RESULT IN MATERIAL
R COMBUSTION.

R (2) Topcoated parts, showing bare metal will be touched up
R with primer and topcoat, unless subsequently overcoated
R with sealant.

R G. Adhesive primered areas

R (1) Areas coated with cured adhesive primer will be touched
R up with primer and topcoat.

R H. Topcoat

R (1) Wash primer may be omitted when minor bare spots are R touched up.

R (2) Minor nicks or scratches in topcoat but not through R primer need not be touched up unless required for R appearance purposes.

R J. Integral fuel tank coating

R (1) Non-fuel containing areas:

R WARNING: USE SEALANT IN WELL VENTILATED AREA. DO NOT R INHALE VAPOR, AND AVOID FLUID CONTACT WITH R SKIN AND EYES. PROLONGED EXPOSURE MAY RESULT R IN LUNG, SKIN OR EYE IRRITATION.

R (a) Touch up all scratches or other damage to coating R which penetrate to bare metal with a brush coat of R LCM40-2180 Type II sealant approximately .010 inch R thick.

R (2) Fuel soaked areas.

R WARNING: USE COMPOUND IN WELL VENTILATED AREA. DO NOT R INHALE VAPOR, AND AVOID FLUID CONTACT WITH R SKIN AND EYES. PROLONGED EXPOSURE MAY RESULT R IN UNCONSCIOUSNESS OR SKIN OR EYE IRRITATION.

R (a) Touch up all scratches or other damage to coating R on lower wing skin and stringer tops by brushing R or spraying with C-40-668 Type II coating R approximately .002 inch thick.

R NOTE: This requirement applies to all wing tank R areas including wing center box.

R K. Attaching parts

R (1) Standard attaching parts such as nuts, bushings, R spacers, laminated shims, washers, rivets, high-shear R rivets, screws, self-tapping screws, sleeves for R "shakeproof" fastener studs, self-locking nuts, "speed R nuts", clamps, and clips not painted in detail but R located in painted areas, will be touched up using same R finish as applied to adjacent areas, except as follows:

R (a) Following parts will not be touched up:

R • Parts inside electrical junction boxes.

R • Parts used for making electrical junction
R boxes.

R • Parts which are subsequently lubricated.

R • Fasteners in fuel containing areas.

R (b) Following parts need not be touched:

R • Parts in blind or inaccessible areas.

R • Solid film lubricated surfaces.

R • Nuts and heads of bolts in joints that are
R subsequently lubricated.

R • Parts subsequently coated with corrosion
R preventive compound.

R • Plate nuts, plate nut attaching rivets and
R titanium fasteners used in attaching blowout
R panels to cargo liners.

R NOTE: When wash primer is part of original
R surrounding area finish, it may be omitted
R on attaching parts.

R L. Electrodeposited plating

R (1) Touch up damaged, discrepant, thin or bare areas of
R electrodeposited plating on low alloy steel with stylus
R applied cadmium plating.

R (2) Area to be touched up must not exceed 10 percent of
R total plated area of part.

R M. Metallic ceramic coating

R WARNING: USE METHYL-ETHYL-KETONE IN WELL VENTILATED AREA.
R AVOID FLUID CONTACT WITH SKIN AND EYES. PROLONGED
R EXPOSURE MAY RESULT IN SKIN OR EYE IRRITATION.
R KEEP AWAY FROM HEAT, SPARKS AND OPEN FLAME.
R FAILURE TO COMPLY MAY RESULT IN MATERIAL
R COMBUSTION.

R (1) Clean surface to be touched up with M.E.K.

R WARNING: AVOID MATERIAL CONTACT WITH SKIN. PROLONGED
R EXPOSURE MAY RESULT IN SKIN IRRITATION.

R (2) Brush coat, air dry aluminum filled ceramic coating to
R a thickness of one to three mils.

R (3) Allow coating to air dry a minimum of 30 minutes prior
R to handling.

R N. Molded thermoplastic parts.

R (1) Parts that do not meet color match requirements or have
R minor surface damage may be painted with EPS 37.7070.

R WARNING: USE NAPTHA IN WELL VENTILATED AREA. DO NOT
R INHALE VAPOR AND AVOID FLUID CONTACT WITH
R SKIN AND EYES. PROLONGED EXPOSURE MAY RESULT
R IN RESPIRATORY SYSTEM, SKIN OR EYE
R IRRITATION.

R (a) Clean surface to be painted by wiping with clean
R lint free cloths dampened with naptha.

R (b) Wipe dry with clean lint free cloths, not allowing
R solvent to dry on surface.

R WARNING: USE COATING IN WELL VENTILATED AREA. DO NOT
R INHALE VAPOR AND AVOID FLUID CONTACT WITH
R SKIN AND EYES. PROLONGED EXPOSURE MAY RESULT
R IN UNCONSCIOUSNESS OR LUNG, SKIN OR EYE
R IRRITATION. KEEP AWAY FROM HEAT, SPARKS AND
R OPEN FLAME. FAILURE TO COMPLY MAY RESULT IN
R MATERIAL COMBUSTION.

R (c) Apply paint to a dry film thickness of 0.6 to 0.8
R mil.

R (d) Should crazing become evident during or after
R painting, painting will be stopped and defective
R part rejected.

R P. Adhesion Test

R (1) Testing to determine coating adhesion will be
R determined after coating has been cured for 48 hours.

R (2) Apply, with firm pressure, a one inch wide piece of
R pressure sensitive tape to dried coating.

R (3) Remove tape with one abrupt motion.

R (4) Examine area for paint removal.

R APPLICATION OF PHOSPHATE ESTER RESISTANT PRIMER
R MAINTENANCE PRACTICES

R 1. General

R This procedure establishes requirements for application of
R Phosphate Ester Resistant Epoxy Primer.

R 2. Equipment and Materials

R Cleaner, Petroleum Based, Non-Photochemically Reactive:
R Pennwalt Corp., (FSCM 99987), P/N 4091-C; Lockheed P/N LCM
R 32-1086; or equivalent.

R Safety Solvent: Pennwalt Corp., (FSCM 99987), P/N 842; Lockheed
R P/N EPS 41.400; or equivalent.

R Primer Coating, Epoxy, Phosphate Ester Resistant: Deft Chemical
R Coatings, (FSCM 33461), P/N 02-GN-28; Lockheed P/N LCM 37-1035;
R or equivalent.

R Corrosion and Heat Resistant Steel Cleaning and Passivating
R Compound: Products Research and Chemical Corp., Semco Div.,
R (FSCM 83574), P/N Pasa-Jell 101; Lockheed P/N EPS 32.3901; or
R equivalent.

R Acid, Nitric, Technical Grade: Open Vendor; Fed. Spec. O-N-350;
R or equivalent.

R Abrasive Paper, 320 Grit, or equivalent.

R Scotchbrite Pads, or equivalent.

R Cloths, Lint Free, or equivalent.

R Sand, 320 Grit or Finer, or equivalent.

R 3. Referenced Procedures

R	FEDERAL STANDARD -141,	
R	Method 6301	Paint, Varnish, Lacquer
R		and Related Materials
R		Method of Inspection,
R		Sampling and Testing

R 4. Maintenance Practices

R A. Surface Preparation

R (1) Aluminum Surfaces

R CAUTION: PROTECT ANODIZED SURFACES FROM CONTAMINATION AND
R DO NOT PAINT 2 HOURS BEFORE OR 30 DAYS AFTER
R SURFACES HAVE BEEN ANODIZED. ALL PARTS NOT
R PAINTED BEFORE 30 DAYS MUST BE STRIPPED AND
R REPROCESSED

R PROTECT CHEMICAL CONVERSION COATED PARTS FROM
R CONTAMINATION AND DO NOT PAINT 2 HOURS BEFORE OR
R 14 DAYS AFTER CHEMICAL CONVERSION COATING HAS BEEN
R APPLIED. ALL PARTS NOT PAINTED BEFORE 14 DAYS
R MUST BE STRIPPED AND REPROCESSED.

R (2) Stainless Steel Surfaces

R (a) Abrade thoroughly with 320 grit abrasive paper,
R Scotchbrite pads, or sandblast with 320 or finer
R grit, or passivate as outlined in Para. 3.E.

R WARNING: USE PETROLEUM BASE CLEANER IN WELL VENTILATED
R AREA. DO NOT INHALE VAPOR AND AVOID CONTACT WITH
R SKIN AND EYES. KEEP AWAY FROM HEAT SPARKS AND
R OPEN FLAME

R KEEP VOLATILE CLEANING SOLVENTS IN AIR TIGHT
R CONTAINERS TIGHTLY CLOSED WHEN NOT IN USE. KEEP
R SOLVENT SOAKED RAGS FROM ACCUMULATING IN WORK
R AREA.

R (b) Wipe with LCM 32-1086 Petroleum Cleaner or EPS
R 41.400 safety solvent using clean lintfree cloths.

R (c) Immediately wipe dry with clean lint free cloth.

R (3) Titanium Surfaces

R (a) Abrade surface with 320 grit abrasive paper or
R Scotchbrite pads, or sandblast with 320 or finer
R grit.

R (b) Wipe with LCM 32-1086 Petroleum cleaner using a
R lint free cloth.

R (c) Immediately wipe dry with clean lint free cloth.

R (4) Adhesive Primer Primed Surfaces.

R WARNING: USE PRIMER IN WELL VENTILATED AREA. DO NOT INHALE
R VAPOR AND AVOID FLUID CONTACT WITH SKIN AND EYES.
R PROLONGED EXPOSURE MAY RESULT IN UNCONSCIOUSNESS
R OR LUNG, SKIN OR EYE IRRITATION.

R (a) After bonding has been completed, apply LCM
R 37-1035 phosphate ester resistant epoxy primer
R directly over cleaned metal bonding adhesive
R primer.

R NOTE: For best results, accomplish application of
R sealants and primers where temperature is
R between 60 and 100 degrees Farenheit (15.6
R to 37.8 degrees Centigrade) and relative
R humidity is between 20 and 85 percent.

R (5) Cadmium Plated Surfaces.

R (a) Wipe all surfaces that have been coated with
R chemical conversion coating with LCM 32-1086
R Petroleum Cleaner using clean lint free cloths.

R (b) Immediately wipe dry with clean dry cloth.

R B. Application

R WARNING: USE PRIMER IN WELL VENTILATED AREA. DO NOT INHALE
R VAPOR AND AVOID FLUID CONTACT WITH SKIN AND EYES.
R PROLONGED EXPOSURE MAY RESULT IN UNCONCIOUSNESS OR
R LUNG, SKIN OR EYE IRRITATION.

R (1) Epoxy Primer Film Thickness.

R (a) Apply a coat of LCM 37-1035 primer to an average
R dry film thickness between 0.5 and 0.7 mil, with
R no reading less than 0.4 mil, and no reading
R greater than 1.0 mil, except for parts which are
R complex in shape from a painting standpoint, such
R as: channels, T's, hat sections, flanged parts
R etc.

R (b) Average dry film thichness on complex parts (from
R a painting standpoint) must be between 0.5 and 0.8
R mil with no reading less than 0.4 mil and no
R reading greater than 1.5 mils.

R (c) Do not apply epoxy primer to chemically film
R treated surfaces 2 hours before or 14 days after
R application of chemical film treatment.

(d) Apply primer keeping it free from grit, seeds, blisters or any other surface irregularities.

NOTE: Primer coat is not meant to be a hiding coat.

C. Drying

(1) Epoxy Primer may be overcoated after 30 minutes of air drying at a minimum temperature of 65 degrees Farenheit (18.33 degrees Centigrade.)

(2) Dry epoxy primer before stacking, handling or masking parts using one of the following methods:

(a) Air dry a minimum of two hours at a minimum temperature of 65 degrees Farenheit (18.33 degrees Centigrade).

(b) Air dry a minimum of 3 minutes at a minimum temperature of 65 degrees Farenheit (18.33 degrees Centigrade), follow up by force drying in an oven pre-heated to a temperature of 140 to 160 degrees Farenheit (60 to 71.11 degrees Centigrade) for a minimum of 10 minutes total oven time, or equivalent.

NOTE: Equivalent force drying methods must be subject to Lockheed engineering approval.

D. Curing

(1) Cure primed parts using one of the following methods:

R (a) Air cure for a minimum of 168 hours at a temperature of 65 to 85 degrees Farenheit (18.33 to 29.44 degrees Centigrade).

(b) Air dry for a minimum of three minutes at a temperature of 65 to 85 degrees Farenheit (18.33 to 29.44 degrees Centigrade), followed by force
R curing in a preheated oven to a temperature of 140
R to 160 degrees Farenheit (60 to 71.1 degrees Centigrade) for a minimum of two hours total oven time, or equivalent.

NOTE: Equivalent curing methods must be subject to Lockheed engineering approval.

E. Passivating

R CAUTION: DO NOT ALLOW PASSIVATING COMPOUND OR RESIDUE TO
R ENTER FAYING SURFACES OR AREAS OF ENTRAPMENT.

R (1) All 200 and 300 series stainless steels, 21-6-9 CRES,
R precipitation hardened (PH) corrosion resistant steels,
R type 431 stainless steel heat treated to any strength
R level, and all 400 series stainless steels heat treated
R to 160 KSI ultimate tensile strength (UTS) and above
R must be passivated by one of the following methods as a
R final processing method unless otherwise specified:

R NOTE: Passivation is not required on parts which will
R be subsequently plated.

R (2) Welded plumbing assemblies and other assemblies
R requiring passivation, which are impracticable to
R passivate by immersion processing after welding or
R fabrication, must be passivated in detail before
R welding or fabricating.

R CAUTION: DO NOT PASSIVATE STAINLESS STEEL ASSEMBLIES THAT
R HAVE BEEN BRAZED WITH SILVER BRAZING ALLOY OR WITH
R NICKEL BRAZING ALLOYS CONTAINING LESS THAN SEVEN
R PERCENT CHROMIUM.

R WARNING: USE PASSIVATING COMPOUND IN WELL VENTILATED AREA.
R DO NOT BREATH VAPORS. AVOID CONTACT WITH SKIN,
R EYES OR CLOTHING. SPILLAGE MAY CAUSE FIRE OR
R LIBERATE DANGEROUS GAS.

R (3) After welding or fabrication accessible weld areas,
R heat affected areas or other exposed surfaces, must be
R passivated with EPS 32.3901 passivating compound.
R Passivating compound must be applied and maintained in
R contact with areas to be treated, for 10 to 15 minutes.

R (4) Re-apply passivating compound to effect passivation as
R required.

R (5) After passivation remove all residue by rinsing with
R water or wiping with an applicator wetted with water.

R F. Passivating Solutions

R All stainless steel alloys must be passivated when required
R using the following method except as noted in Para. 4.E. for
R passivating after welding:

R (1) Nitric Acid Treatment

R WARNING: DO NOT BREATH VAPOR. AVOID CONTACT WITH
R EYES, SKIN OR CLOTHING. SPILLAGE MAY CAUSE
R FIRE OR LIBERATE DANGEROUS GAS.

R (a) Immerse for 30 to 60 minutes in a 30 to 60
R ounce/gallon solution of O-N-350 Nitric Acid and
R water maintained between room temperature and 140
R degrees Fahrenheit (60 degrees Centigrade)
R followed by a hot water rinse at a minimum of 150
R degrees Fahrenheit (65.5 degrees Centigrade)
R minimum and dried, or immersed for 20 to 30
R minutes in a 55 to 70 ounce/gallon solution of
R O-N-350 Nitric Acid and water maintained at 120 to
R 140 degrees Fahrenheit (49 to 60 degrees
R Centigrade) followed by a hot water rinse at 150
R degrees Fahrenheit (65.5 degrees Centigrade)
R minimum, and dried.

R G. Inspection and Check

R (1) Adhesion Test

R (a) Allow primer to air dry for a minimum of 48 hours
R or force cure according to Step 4D(1)(b) before
R performing adhesion test.

R NOTE: Failed areas occurring prior to full cure
R as specified in Step 4D(1) will not be
R cause for rejection but will be reworked as
R necessary.

R (b) Apply a sponge saturated with water and covered
R with a plastic cap to primed surface to be tested.

R (c) Remove sponge and plastic cap after 24 hours.

R (d) Tape test surface to which sponge was applied, in
R accordance with FED-STD-141, method 6301, except
R surface will not be scribed.

APPLICATION OF WEATHER RESISTANT POLYURETHANE ENAMEL – LCP78-1133C

1. SCOPE

1.1 This specification establishes the requirements for the application of C-37-1348 Polyurethane Coating.

2. APPLICABLE DOCUMENTS

SPECIFICATIONS

Federal

TT-M-261	Methyl-Ethyl-Ketone

Military

MIL-C-27725	Coating, Corrosion Preventive, For Aircraft Integral Fuel Tanks

Lockheed

C-32-337	Cleaner, Integral Tank (Chlorinated Type)
C-37-1348	Coating, Polyurethane, Interior, High Gloss
LCM32-1086	Cleaner, Petroleum Base, Non-Photochemically Reactive
LCM37-1035	Primer Coating, Epoxy, Phosphate Ester Resistant
LCP76-1251	Removal of Epoxy and Polyurethane Paint from Interior Parts and Surfaces
LCP78-2054	Coating, MIL-C-27725, Preparation and Application of

STANDARDS

Federal

FED-STD-141	Paint, Varnish, Lacquer, and Related Materials, Methods of Inspection, Sampling and Testing

2.2 The following commercial materials covered by the Lockheed Corporate Engineering Purchasing Specification (CEPS) Manual form a part of this specification to the extent specified herein:

Material	CEPS Item
Safety Solvent, Cleaner	L31.1916

3. REQUIREMENTS

3.1 The polyurethane coating material shall conform to the requirements of C-37-1348 and shall not be applied if the shelf life of 12 months is exceeded. The topcoat color shall be LAC 1078A, White, unless otherwise specified on the Engineering drawing.

3.2 Mixing and application equipment

3.2.1 Air spraying or premixed airless. - The base and catalyst components shall be mixed in equal volumes according to the manufacturer's instructions. The mixed components may be sprayed immediately after mixing, no minimum digestion or sweat time is required.

3.2.1.1 Mixed material shall not be used if the pot life of 3 hours maximum at 90°F or below is exceeded.

3.2.1.2 Base and catalyst material, in partially used containers, may be stored for a maximum of 7 days prior to mixing and spraying, provided storage is in the re-sealed containers.

3.2.2 Continuous mixing airless spraying. - Grayco Hydrocat Airless spray equipment only shall be used for continuous mixing spray applications. Base and catalyst containers, used in the pumping system, shall be left open to the atmosphere for a maximum of 24 hours. A nitrogen blanket may be used over the base and catalyst containers; in which case, the maximum storage time is 7 days.

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3.2.3 Safety and health precautions. - All precautions normally used in mixing and applying organic coatings shall be observed when mixing and applying the coating. Painting may be done outside a paint booth, providing safety regulations are met. The mixed uncured components of this material will produce irritation upon contact with the skin, eyes, or clothing. Avoid breathing vapors. When handling the components of this material, avoid contact with the body, especially on open breaks in the skin; avoid ingestion (swallowing). Always wash hands thoroughly before eating or smoking.

3.3 Substrate Preparation

3.3.1 Bare metal. - The polyurethane coating shall not be applied to bare, unprimed metal surfaces, only substrates discussed below may be topcoated.

3.3.2 LCM37-1035 Primer. - When polyurethane topcoat is applied to LCM37-1035 Phosphate Ester Resistant Primer, the primer shall be dried and cleaned in accordance with one of the following procedures. In all cases, the primer shall air dry at least 1/2 hour at 65°F minimum or may be force dried at an elevated temperature of 150 ± 10°F for 10 to 20 minutes, following a 3-minute air dry, before overcoating.

3.3.2.1 Primer, air dried for less than 96 hours and with an uncontaminated surface, may be topcoated with no additional surface preparation.

3.3.2.2 Primer, air dried over 96 hours or primer which has surface contamination shall be wiped clean with either TT-M-261 Methyl-Ethyl-Ketone, C-32-337 Cleaner, or Safety Solvent (CEPS L31.1916). Wipe surfaces dry, do not allow solvent to evaporate dry. The topcoat shall be applied within 1/2 hour after cleaning.

3.3.3 MIL-C-27725 IFT Coating. - When the polyurethane coating is applied over MIL-C-27725 Corrosion Preventive Coating, the corrosion preventive coating shall be cured in accordance with LCP78-2054, cleaned with LCM32-1086 Petroleum Base Cleaner, C-32-337 Cleaner, or Safety Solvent (CEPS L31.1916) and then wiped dry. The topcoat shall be applied within 1/2 hour after solvent cleaning.

3.3.4 Reinforced plastic laminates. - Surface of reinforced plastic laminates shall be prepared for topcoating in accordance with LCP78-2059.

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3.4 Thickness control

3.4.1 Dry film thickness of the topcoat shall be 1.0 to 1.5 mils. This film thickness will not give full hiding, and some shadows may be visible.

3.4.2 The total dry film thickness of the final paint system, primer plus topcoats, shall be 1.5 to 2.2 mils, except for parts which are complex in shape from a painting standpoint, such as: channels, T's, hat sections, flanged parts, etc., where the average dry film thickness shall be 1.5 to 2.2 with no readings less than 1.0 nor more than 3.0 mils in isolated areas. Tubular members coated by fill and drain methods on interior surfaces shall have complete coverage, as determined by visual inspection, without a thickness requirements.

3.5 Dry time

3.5.1 Handling. - Prior to handling, the polyurethane coating shall be dried in accordance with either (a) or (b), as follows:

(a) The polyurethane coating shall air dry at not less than 65°F for a minimum of 5 hours.

(b) Allow the polyurethane coating to air dry a minimum of three minutes, followed by force drying the coated parts in an oven pre-heated to 150 ± 10°F for a minimum of 19 minutes total oven time, or equivalent. Allow the parts to cool for 10 minutes, minimum, at not less than 65°F. Equivalent methods shall be subject to Lockheed Engineering approval.

3.5.2 Overcoating. - Prior to overcoating, the polyurethane coating shall be dried for a minimum of 1 hour at not less than 65°F.

3.6 Cure time

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3.6.1 Fluid resistance. - Prior to exposure to fuels, solvent, or sealant, parts shall be cured in accordance with either (a) or (b), as follows:

(a) Air cure for a minimum of 168 hours at not less than 65°F.

(b) Air dry for 6 to 8 hours at not less than 65°F, followed by force curing in an oven pre-heated to 150 ± 10°F for a minimum of 8 hours total oven time, or equivalent. Equivalent methods shall be subject to Lockheed Engineering approval.

3.6.2 Water resistance. - Wet tape testing may be initiated after the parts have dried 48 hours at not less than 65°F. If failure occurs, the parts should be retested after the parts have dried 168 hours at not less than 65°F.

3.7 Adhesion

3.7.1 Wet tape test. - When applied in accordance with the requirements of this specification, the polyurethane topcoat shall show no loss of adhesion when wet tape tested as specified in 4.2.1.

3.7.2 Touch-up areas. - Touch-up coating on fasteners, damaged areas, trimmed edges, etc. shall show no loss of adhesion when tested as specified in 4.2.2.

3.8 Surface appearance. - The polyurethane coating shall be applied in such a manner that the resulting finish shall be free from grit, seeds, streaks, orange peel, blisters, pinholes, fisheyes or any other surface irregularities, except to a very minor degree.

3.9 Rework. - If rework is necessary, the paint shall be stripped in accordance with LCP76-1251, and the affected area touched up as specified on the Engineering drawing.

4. QUALITY ASSURANCE PROVISIONS

4.1 Sufficient surveillance shall be exercised to ensure compliance with the requirements of this specification.

4.1.1 Testing. - Testing shall be conducted, at the discretion of Quality Assurance, to ensure conformance to the requirements of this specification.

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APPLICATION OF EXTERIOR COATING SYSTEM FOR THE L-1011 AIRCRAFT

1. SCOPE

1.1 Scope. - This bulletin establishes the requirements for applying the L-1011 exterior polyurethane coating system.

2. APPLICABLE DOCUMENTS

Federal

TT-M-261	Methyl-Ethyl-Ketone
FED-STD-141	Paint, Varnish, Lacquer, and Related Materials Sampling and Testing

Military

MIL-A-9962	Abrasive Pad, Very Fine

Lockheed

C-37-1103	Exterior Coating System, Polyurethane, Weather Resistant
LCM32-1086	Cleaner, Petroleum Base, Non-photochemically Reactive
LCM32-1249	Cleaner, Aluminum Phosphoric Acid Type
LCP77-1022	Chemical Film Protective Treatment, Colored, Non-Immersion, For Aluminum and Aluminum Alloys
LCP78-1131	Application of Phosphate Ester Resistant Epoxy Primer
LCP78-2039	Finishing of Glass Fabric Reinforced, Laminated Plastic Parts and Assemblies

3. REQUIREMENTS

3.1 After required masking, all surfaces to be painted shall be cleaned and conditioned in accordance with the requirements and sequence of operations as specified herein.

3.1.1 Atmospheric conditions. - The preparation of the surfaces and application of the exterior coating system shall be carried out in an area protected from dust and weather. The application and curing of wash primer and the curing of polyurethane intermediate primer and topcoat shall be carried out at temperature of 65°F minimum and relative humidity of 20% to 80%.

3.1.2 All metal surfaces shall be cleaned with LCM32-1086 Cleaner or TT-M-261, Methyl-Ethyl-Ketone. Apply with clean, lint-free white cloths followed immediately by wiping with clean, dry, lint-free white cloths.

* 3.2 Fabric reinforced laminates. - All fabric reinforced laminate surfaces shall be cleaned and conditioned in accordance with LCP78-2059. Apply intermediate primer and polyurethane enamel in accordance with 3.7 and 3.8 respectively. No wash primer shall be applied to fabric reinforced laminates.

* 3.3 Aluminum flame sprayed surfaces. - Aluminum flame sprayed surfaces which require painting shall be treated and painted with one of the following sequences. Total coating thickness shall conform to the requirements of 3.8.2.

* 3.3.1 Chemical film-epoxy primer system

a. Solvent clean per 3.4.1

b. Abrade entire surface per 3.4.2 and rinse per 3.4.2.1

c. Apply chemical film treatment per LCP77-1022

d. Prime with LCM 37-1035 epoxy primer in accordance with LCP78-1131

e. Apply top coat, C-37-1103 Type III in accordance with 3.8

f. When required to eliminate pin holes or other surface irregularities, after step (d), a full wet coat of unthinned intermediate primer, C-37-1103 Type II may be applied in a manner sufficient to fill voids and cover rough areas. After the intermediate primer has dried a minimum of 12 hours, sand down to appearance of blue primer using care to avoid sanding into the flame spray. Solvent clean per 3.4.1 and apply a wet mist coat of LCM 37-1035 primer to entire sanded surface. Apply topcoat per item (e).

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* 3.3.2 Wash primer system

a. Solvent clean per 3.4.1

b. Abrade entire surface per 3.4.2 and rinse per 3.4.2.1

c. Solvent clean per 3.4.1

d. Apply wash primer, intermediate primer and topcoat in accordance with 3.6, 3.7, and 3.8 respectively

3.3.3 Where interior epoxy primer, LCM37-1035, is required to be applied to exterior surfaces, the polyurethane topcoat shall be applied in accordance with 3.8. The primer may be overcoated after 30 minutes air dry. If the primer has cured more than 48 hours, it must be abraded using 320 grit paper and cleaned with LCM32-1086 Cleaner or TT-M-261 Methyl-Ethyl-Ketone prior to topcoating.

3.4 Metal surfaces

3.4.1 All aluminum surfaces and steel alloy surfaces shall be cleaned with LCM32-1086 Cleaner or TT-M-261 Methyl-Ethyl-Ketone. Apply with clean, lint free, white cloths followed immediately by wiping with clean, dry, lint free, white cloths.

3.4.2 Non-anodized aluminum surfaces and titanium alloy surfaces to be painted on the exterior surfaces of the airplane shall be abraded with MIL-A-9962 very fine abrasive pads and water.

3.4.2.1 Spray rinse the abraded surfaces with tap water.

3.4.2.2 Apply phosphoric acid cleaner, LCM32-1248, to the abraded surfaces using clean lint free cloths or fiber-bristle brushes. Keep agitating on the surfaces with a fiber scrub brush during a 5 minute dwell time. Do not allow the phosphoric acid cleaner to dry on the surfaces. Thoroughly spray rinse the surfaces with clean water.

Monitor for "water break free" surfaces during the rinsing operation. If "water break free" surfaces cannot be attained, repeat 3.4.2 through 3.4.2.2. A surface is "water break free" if the water used in the rinsing operation tends to coalesce into large lenses (without sudden flashout). If the water forms a continuous film by flashing out suddenly over a large area, then this shall be considered evidence of the presence of an impurity on the surface, and the surface shall be considered as having failed the test. Failure to support an unbroken water film shall be sufficient cause to re-clean as specified above. While surfaces are still wet from the water rinse required above, check surface condition with "Hydrion" paper. The surfaces should be neutral or slightly acid (pH 6.0 to 7.0). If an acid condition of less than 6.0 exists, re-rinse surface with tap water and re-check. Allow the surfaces to completely dry for 2 to 24 hours at a minimum of 70°F before wash primer application.

3.4.3 Apply the wash primer, intermediate primer, and polyurethane enamel in accordance with 3.6, 3.7, and 3.8 respectively.

3.5 Safety and health precautions. - All precautions normally used in mixing and applying organic coatings must be observed. When mixing and applying coatings avoid prolonged breathing of vapors or contact with skin. Insure adequate ventilation. Do not use near open flames or sparks. Always wash hands thoroughly before eating.

3.6 Wash primer application

3.6.1 Wash primer, C-37-1103 Type I, shall be mixed according to the manufacturer's instructions.

3.6.2 The wash primer coating shall be applied as a wet film to the surfaces to be painted. The dry film thickness shall be 0.2 to 0.4 mils. The primer shall be applied within 4 hours of mixing. Discard mixed primer that has exceeded time limitation.

3.6.3 The wash primer shall be allowed to dry not less than 30 minutes nor more than 24 hours at 65 to 90°F before application of the intermediate primer.

3.6.4 Removal of local roughness. - The primer may be lightly rubbed with kraft paper to remove projections, specks, or local roughness. Runs or sags may be lightly scuffed with No. 320 paper to reduce excessive thickness. Exercise extreme care not to reduce primer thickness below 0.2 mils.

3.7 Intermediate primer application. - Intermediate primer C-37-1103 Type II shall be mixed according to manufacturer's instructions.

3.7.1 Apply one coat of intermediate primer to a dry film thickness of 0.5 to 0.8 mils.

3.7.2 The intermediate primer shall be applied in such a manner that the resulting finish shall be free from grit, seeds, streaks, orange peel, blisters, pinholes, fisheyes or any other surface irregularities.

3.7.3 The intermediate primer shall be allowed to air dry a minimum of 1-1/2 hours and a miximum of 24 hours prior to overcoating. Primer which has exceeded the 24 hours shall be reactivated by abrading with 320 grit paper and cleaned with TT-M-261 Methyl-Ethyl-Ketone or LMC32-1086 Cleaner.

3.7.4 The intermediate primer must be allowed to dry sufficiently so as not to leave tape marks prior to masking and overcoating (striping).

3.8 Application of polyurethane enamel

3.8.1 Polyurethane enamel C-37-1103 Type III, IV and V shall be mixed according to manufacturer's instructions.

3.8.2 Apply the topcoat to a dry film thickness of 1.5 to 2.0 mils (total film thickness 2.2 to 3.2 mils) to all aircraft except that the dry film thickness on the Eastern Airline aircraft shall be 2.2 to 2.8 mils (total film thickness 2.9 to 4.0 mils).

3.8.3 The coating system shall be applied in such a manner that the resulting finish shall be free from detrimental defects such as blisters, pinholes, fisheyes or cracks. Surface discrepancies that do not affect the overall appearance quality are acceptable.

3.8.4 All the overcoating (windows, belt striping, insignias, stencils, etc.) shall be applied in accordance with 3.9.

3.9 Application of markings

3.9.1 Where markings are to be applied to the topcoated exterior surfaces, the areas to be overcoated shall be thoroughly sanded and tackragged prior to application.

4. QUALITY ASSURANCE PROVISIONS

4.1 Adhesion test. - Testing to determine coating adhesion may be determined after polyurethane enamel has air dried for a minimum of 168 hours at 75°F minimum. Testing shall be as follows: Apply a sponge saturated with water and covered with a plastic cap to the surface to be tested. After 24 hours remove the sponge and plastic cap and tape test the wetted surface as specified in FED-STD-141, Method 6301, except the surface shall not be scribed.

4.2 The thickness of the components of the coating system may be determined with a micrometer or equivalent measuring device on taped test panels painted concurrently with the part.

4.3 The applied coating system shall be inspected for conformance to the requirements of this specification. A high level of workmanship standards shall be maintained.

5. PREPARATION FOR DELIVERY (Not applicable.)

6. NOTES

6.1 There is no government specification covering the requirements of this specification.

6.2 This revision supersedes PB78-433C dated 3-22-78.

FABRICATION AND INSTALLATION OF FIBERGLASS BATT INSULATION IN L-1011 – PB71-471B

1. SCOPE

1.1 This specification establishes the materials and procedures to be used in the fabrication and installation of fiberglass insulation in the L-1011.

2. APPLICABLE DOCUMENTS

2.1 The following specifications and drawings, of the issue in effect on the date of the contract or purchase order, form a part of this specification to the extent specified herein:

Federal

TT-N-95	Naphtha, Aliphatic
V-T-295	Thread, Nylon

Lockheed

C-22-1254	Covering, Insulation Blanket
C-24-1256	Fastener Tape, Hook and Pile
C-26-1184	Insulation, Thermal, Preformed, Bonded Fibrous Glass, Anti-Wetting
C-26-1277	Insulation, Thermal, Fibrous Glass Batt, Anti-Wetting
C-32-337	Cleaner, Integral Tank, Chlorinated Type
LCM30-2084	Cement, General Purpose, Chloroprene
LCM30-2086	Cement, For Vinyl Coated Trim
LCM32-1087	Cleaner, Petroleum Base, For Primed Metals, Non-photochemically Reactive
LCM40-1218	Compound, Sealing, High Temperature Resistant, Quick Repair
LCP79-2029	Bonding of Fastener Tape, Hook and Pile, Nylon or Nomex
LCP79-2061	Adhesives, Application of

2.2 The following commercial materials, covered by the Engineering Purchasing Specification (EPS) Manual, form a part of this Bulletin to the extent specified herein:

Description	EPS Number
Pressure sensitive tape (double face)	24. 1284
Pressure sensitive Tedlar tape (single face	24. 1510
Pressure sensitive neoprene tape (double face)	24. 1380

2.3 The following parts form a part of this bulletin to the extent specified herein:

Installation hardware — Cinch-Monadnock Corp. City of Industry, Calif.

232003 Stud
232007 Disk
230014 Stand Off
232017 Spring Clip
232018 Stud
232019 Spring Clip
232022 Spring Clip
232023 Stud
232024 Base Plate
232025 Base Plate
232027 Disc, Threaded
232031 Disk
232047 Stud
232052 Clip Retainer
232055 Spacer, Counterbored
232056 Clip Retainer

3. REQUIREMENTS

3.1 Materials

3.1.1 Materials referred to in this process bulletin shall conform to the requirements of the applicable specifications listed herein except as otherwise specified on the applicable Engineering drawing.

3.1.2 The insulation shall be either flexible blanket conforming to C-28-1277 or rigid preform conforming to C-28-1184 as specified on the Engineering drawing.

3.1.3 Unless specified otherwise on the Engineering drawing, the covering over the fibrous glass batting shall be a flexible, metallized polyvinyl fluoride (Tedlar) film, conforming to C-22-1254, Type I.

3.2 Fabrication

3.2.1 General

3.2.1.1 The fibrous glass insulation batting shall be completely encased in the polyvinyl fluoride (Tedlar)film covering material.

3.2.1.2 The fibrous glass insulation batting shall not be compressed as a result of application of the covering material.

3.2.1.3 Heat sealing is the preferred method of joining and sealing the polyvinyl fluoride covering, and shall be utilized wherever practical. Sealing by cementing may be utilized for holes, cutouts, slits, etc., in those areas when heat sealing is not practical. Stitching and sewing may be used in special instances when neither heat sealing or cementing is practical.

3.2.1.4 Surface areas to be heat sealed or cemented shall be clean and free from oil, grease, water, solvents, dirt or other contamination. If necessary, clean with C-32-337 Cleaner and allow to air dry for 15 minutes minimum.

3.2.1.5 Defective batts may have holes, tears, and delaminations repaired using the materials covered by this Bulletin.

3.2.2 Heat sealing

3.2.2.1 Equipment. – Heat sealing shall be accomplished primarily with electrically heated "thermal impulse sealers" which are capable of producing straight-line seals. Hand irons may be used to produce seals of irregular shapes and in hard to get to areas. Figure 1 shows a typical sealed batt.

3.2.2.2 When the covering material is heat sealable on only one side, care must be taken during the heat sealing procedure to mate the sealable sides in order to obtain the strongest bond.

3.2.2.3 Width of seal. - Width of a heat seal shall be a minimum of 1/8 inch.

3.2.3 Cementing

3.2.3.1 Joining and sealing of the covering material with cement may be done when heat sealing is not practical. The following general requirements apply.

3.2.3.2 A thin uniform coat of cement, conforming to LCM30-2084 shall be applied to both surfaces to be bonded. Allow this coat to air dry until tacky to the touch. Then join the surfaces. The detailed procedure given in LCP78-2081 for Type 2 adhesive shall be followed.

3.2.3.3 Adequate cure will generally occur within 48 hours at room temperature.

3.2.4 Covering procedure

3.2.4.1 Cut the fiberglass batt insulation to the size and shape indicated on the drawing.

3.2.4.2 Cut the Tedlar covering to the same shape allowing enough excess material around the periphery to cover the edge and make a seal.

3.2.4.3 Lay the fiberglass batt between two sheets (or one sheet folded over) of Tedlar covering. The heat sealable surfaces of the covering shall face the insulation.

3.2.4.4 Seal the covering together around the edges of the fiberglass batt. The seams shall be made close to the edges of the insulation so that the covering fits snugly but without compressing the fiberglass.

3.2.4.5 Attaching Tedlar covering to the fiberglass batt.

3.2.4.5.1 The Tedlar covering shall be heat bonded to both surfaces of the fiberglass batt to prevent the covering from "bagging" during installation and service use (see Figure 1). The Tedlar covering shall be bonded over a minimum of 70% of the surface area. No unbonded area shall exceed six inches in maximum dimension, or 30 square inches in total area. Any equipment may be used which effects a satisfactory heat bond.

3.2.4.5.2 In special instances, where required by the Engineering drawing, the fiberglass batt insulation shall be held in place within the Tedlar covering by a sewn stitching through the covering and the fiberglass batt. A coarse stitch, using an appropriate nylon thread conforming to V-T-295, shall be made without compressing the fiberglass batt more than 20% in the area of the stitching. The stitching shall be in an X pattern across the batt. The rows of stitches shall be spaced 9 to 12 inches apart.

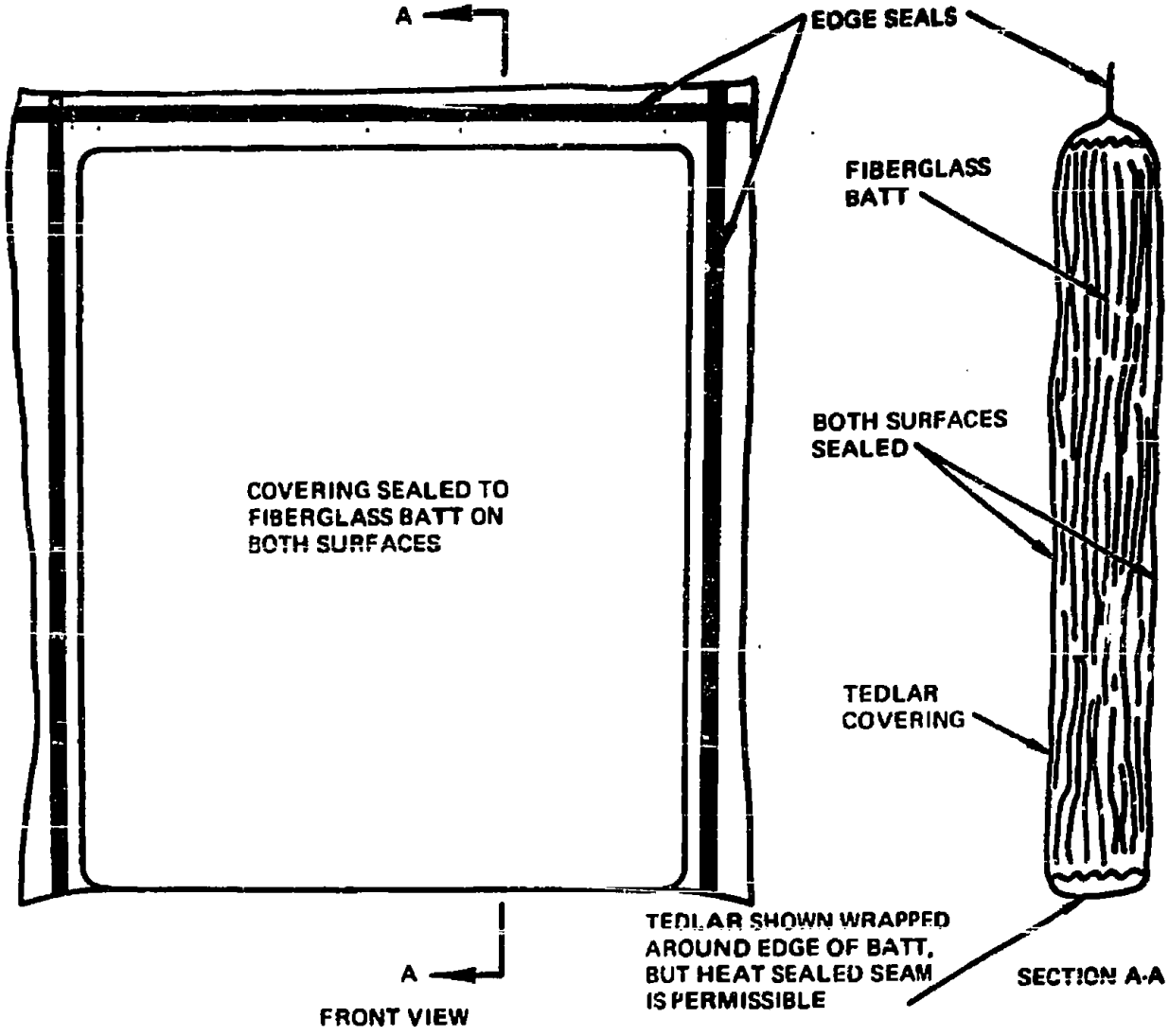

FIGURE 1

3.2.4.6.3 Except where otherwise noted herein, the use of cement or adhesive to bond Tedlar to fiberglass batt shall be avoided. Fiberglass batt is very porous and tends to absorb adhesive in large quantities when it is applied to the batt surface.

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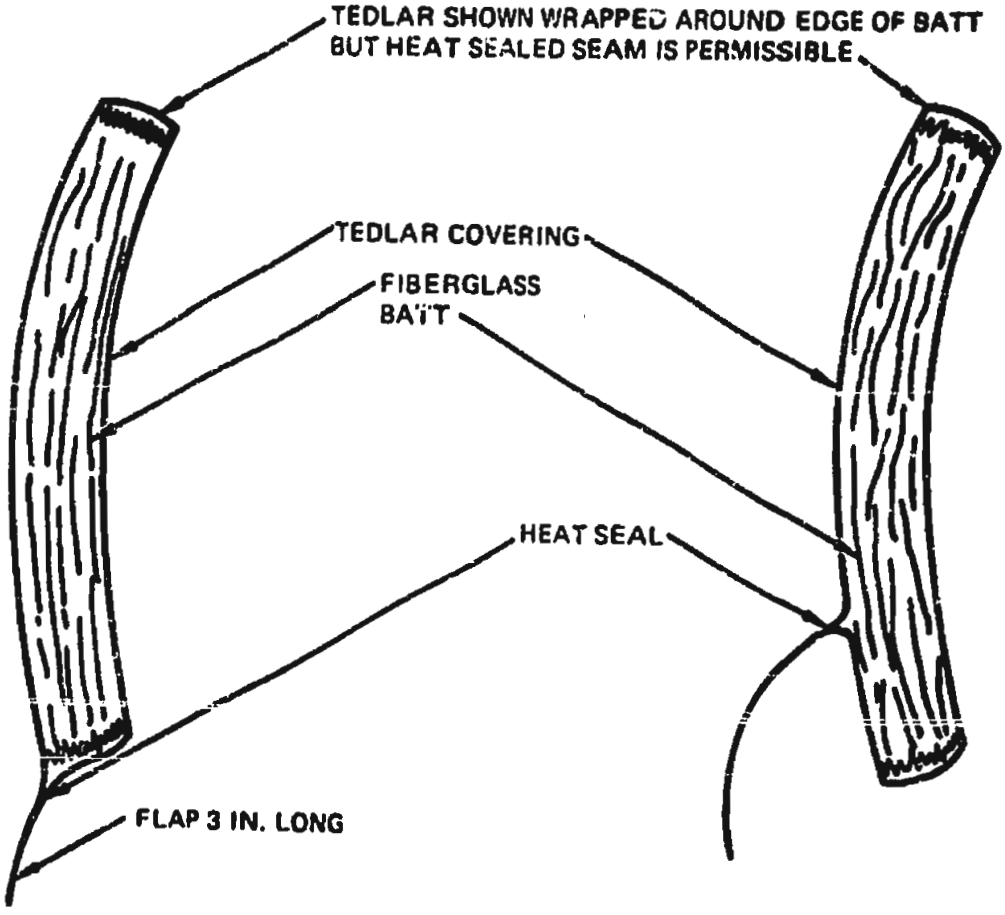
3.2.4.6 The batts against the ceiling of the fuselage from the top down to just above the windows shall have moisture flaps attached to them, which are meant to extend over adjacent batts and act like roof shingles in preventing drip-through of water condensate. Unless otherwise specified on the drawing, such flaps shall be three inches long and as wide as the batt covering and shall be made of Tedlar covering material and shall be constructed as shown in Figure II or Figure III.



CROSS-SECTION
FIGURE II

CROSS-SECTION
FIGURE III

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3.2.4.7 Holes, cutouts and slits in the fiberglass batt shall have their edges covered and sealed. Tedlar covering material or EPS 24. 1510 Tedlar tape shall be used to seal the edges. For common size holes, prefabricated grommets made of Tedlar covering material may be used to save time and labor. Heat sealing is preferred but in many cases cementing will be accepted as the most practical method for sealing the Tedlar around the holes. Figure IV shows some examples of seals. Webs at the side of the airplane's floor and in the beams under the floor contain numerous holes, varying from about 2 to 8 inches in diameter, to permit passage of conditioned air. The fiberglass insulation batts on these webs shall have holes cut into them to coincide with the web holes. After installation, the raw edges of these holes shall be covered and protected with EPS 24. 1510 Tedlar tape.

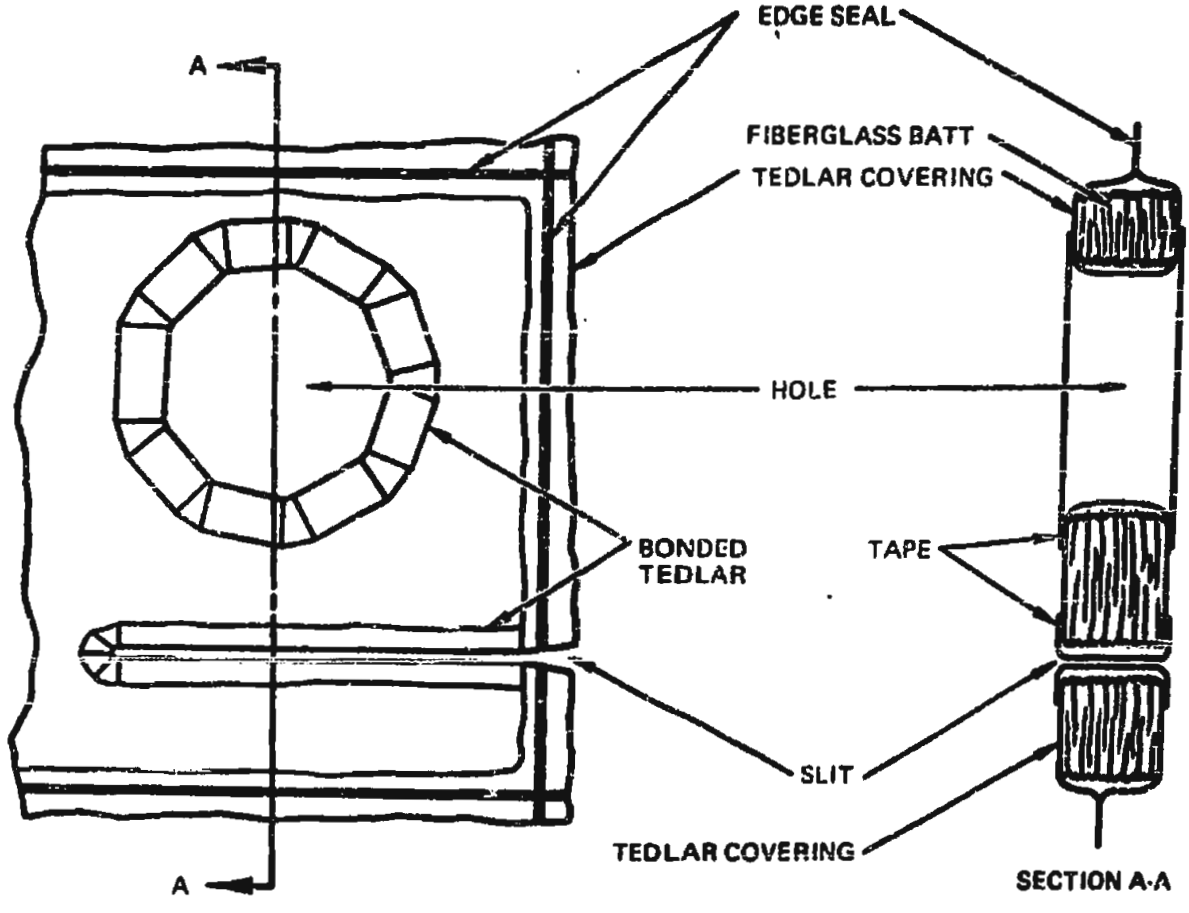

FIGURE IV

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3.2.4.8 After sealing, the excess covering material shall be trimmed so that it does not extend more than 3/8 inch from the seal or bond line.

3.2.4.9 Drain and vent holes, 1/8 to 1/4 inch in diameter, shall be punched in the covering of the batt when it is finished. The drain holes shall be placed at both ends of the batt (top and bottom when the batt is installed in the aircraft), on the edges and near the edge seal line. The holes shall occur once in every twelve inches of edge. At least one hole shall occur on each end.

NOTE: The horizontally installed, underfloor insulation is an exception to this requirement. All batts under the aircraft flooring shall be punctured only on the under side and along the bottom edge.

3.3 Installation

3.3.1 Insulation shall be installed in the aircraft by the various methods shown on the Engineering drawings. Some drawings are explicit about the details of installation and some are not. In the following paragraphs, a number of installation procedures are given together with various details of installation. These are meant to supplement the information on the Engineering drawings wherever necessary.

3.3.2 General. - Fiberflass batts shall be installed with a minimum of compression or squeezing into place and generally should not be compressed to less than 80% of its original thickness at any point. Particular care shall be taken in installing the holding disks on studs to avoid undue compressing of insulation material.

3.3.3 Installation with studs and disks. - Insulation shall be installed by this method wherever possible. Studs and disks shall be used in three principal ways.

3.3.3.1 Stud attached to frame or stringer. - See figure V for example.

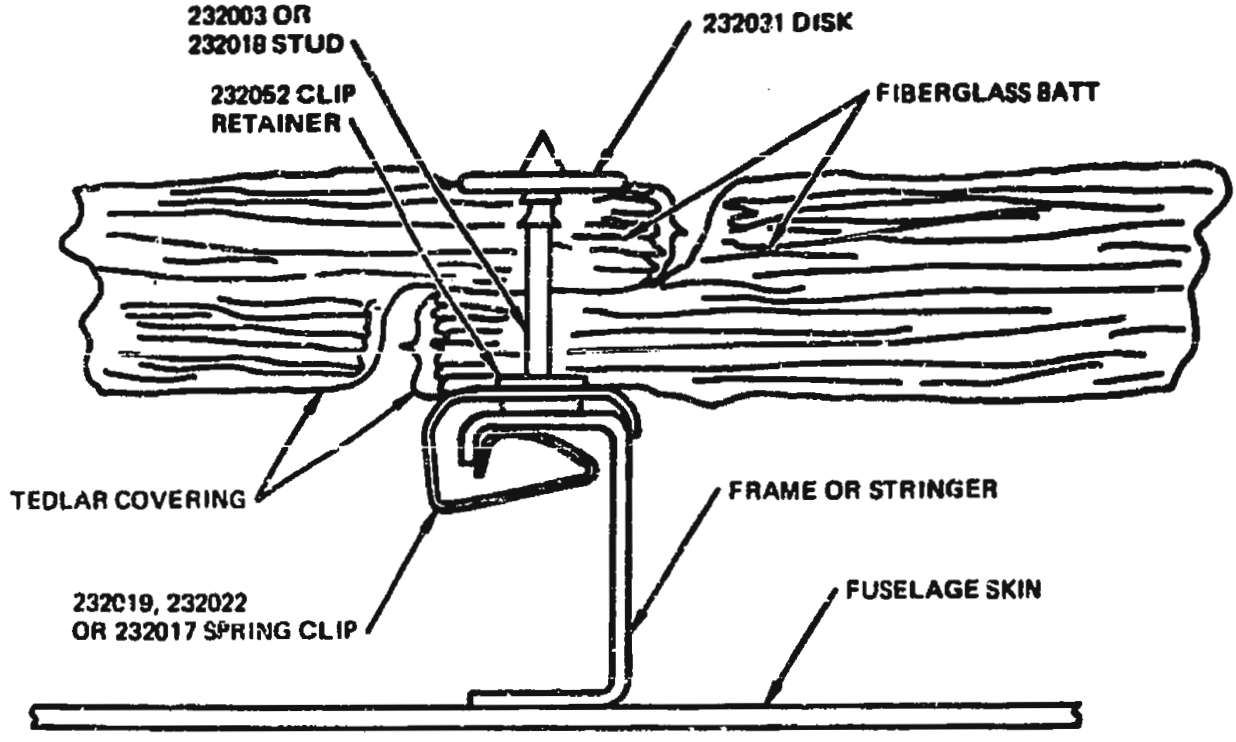

FIGURE V

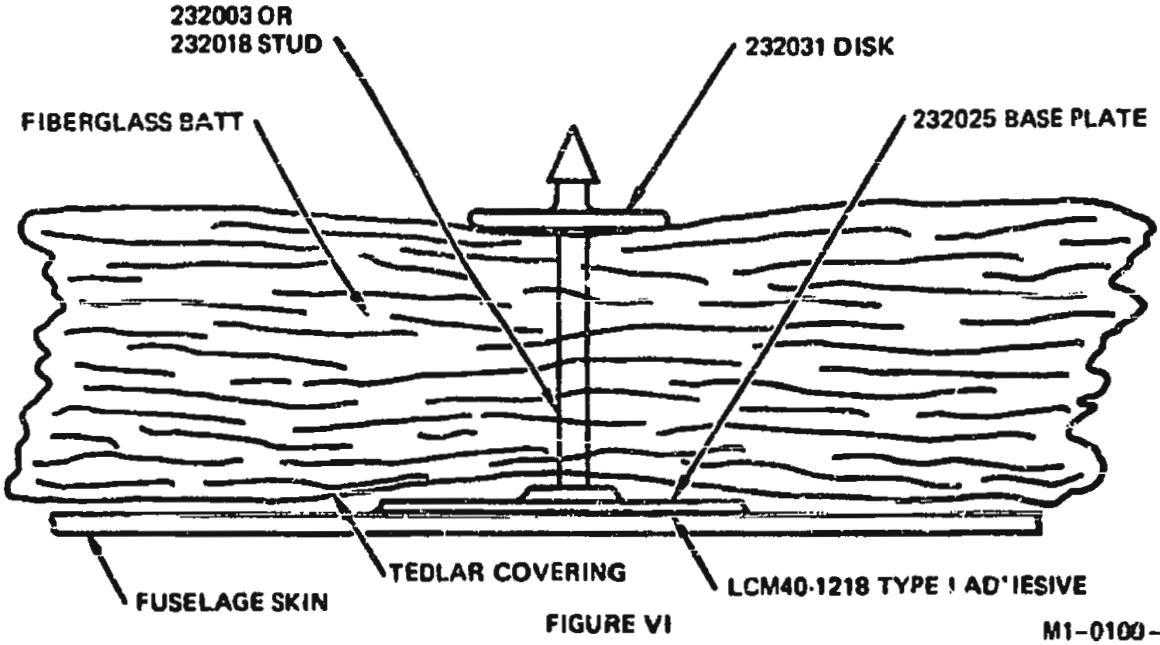

FIGURE VI

M1-0100-20-718

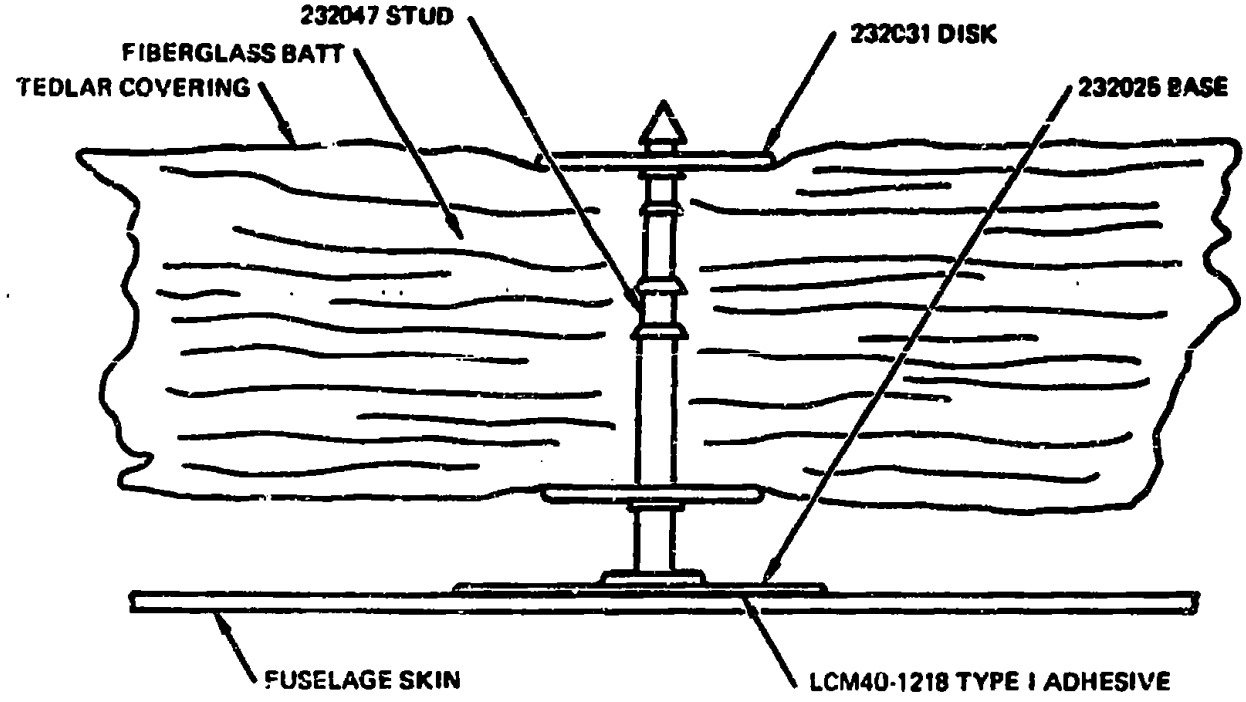

FIGURE VII

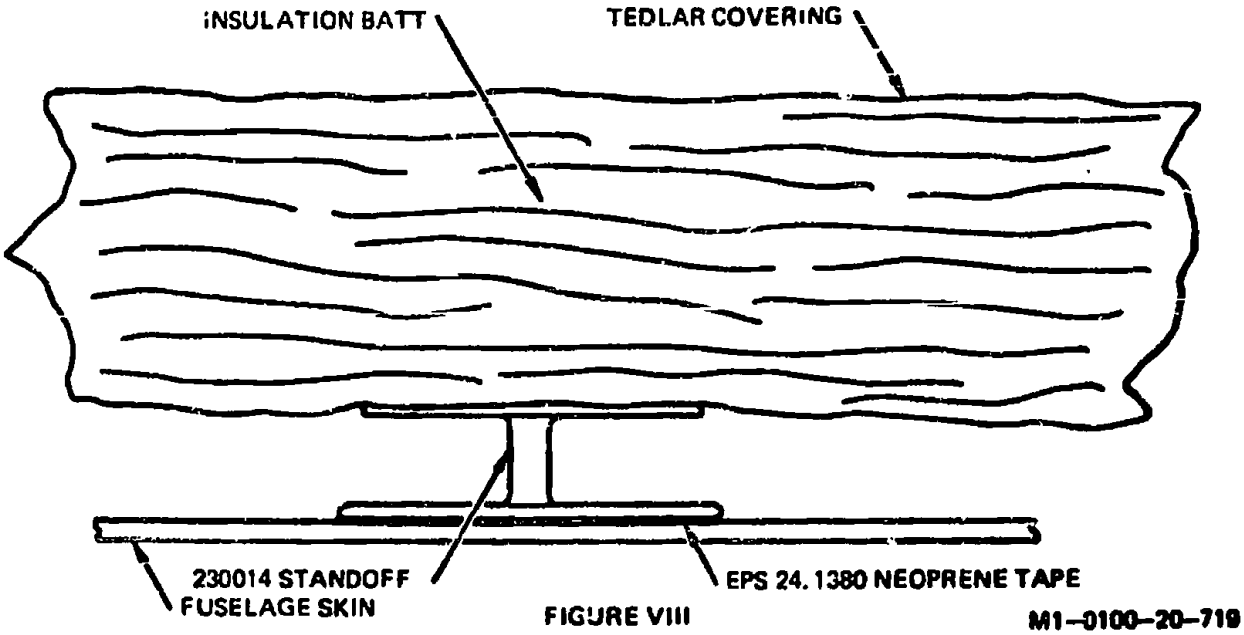

FIGURE VIII

M1-0100-20-719

3.3.3.2 Stud attached to flat areas (fuselage skin). - See Figures VI and VII for examples. In order to bond the metal base to the fuselage skin or other flat metal areas and to hold the nylon stud firmly in the base requires the use of an adhesive compound. The procedure for the use of the adhesive is as follows:

(a) Use polysulfide adhesive LCM40-1218, Type I.

(b) The metal bases, and fuselage metal surfaces where the studs are to be cemented shall be cleaned by wiping with a clean cloth saturated with TT-N-95 aliphatic naphtha or LCM32-1087 solvent. These surfaces shall then be wiped dry with an additional clean dry cloth. Do not allow the cleaner to air dry.

(c) The adhesive compound base material and accelerator shall be mixed in the proportions as supplied in kit form by the manufacturer. Additions of solvent are prohibited. Working life of the adhesive mix is fairly short, about 15 minutes, but can be lengthened slightly by having the compound base and accelerator cooled to 40° to 50° F prior to mixing. The warmer the mix the shorter the working time.

(d) Insert the nylon stud into the metal base.

(e) Apply a sufficient amount of adhesive to the metal base and the base of the nylon stud to ensure complete coverage of the surfaces when bonded (.010 to .030 inch thickness).

(f) Apply the part to the fuselage area with sufficient pressure to obtain complete contact, and cause a slight bead of adhesive to be exuded around the edge of the metal base.

(g) Allow the part to remain undisturbed until the initial set of the adhesive has occurred, 3 hours minimum at 70°F or warmer. (Full cure takes 24 hours at 70°F).

3.3.3.2.1 For the underfloor areas it is desirable to be able to remove the nylon stud and insulation batt for service access. In this area the metal base plate only is cemented to the structure per steps (a), (b), (c), (e), (f), and (g) above. No adhesive is applied to the nylon stud. Following cure of the adhesive the nylon stud is slipped into place in the base and held by retainer clip 232058 as shown in Figure X.

3.3.3.3 Standoff attached to flat areas (fuselage skin). - See Figure VIII for example. The standoff is bonded to the fuselage skin with pressure sensitive double face neoprene tape, (EPS 24, 1380). Clean those areas where the tape is to be bonded by wiping with a clean cloth saturated with TT-N-95 aliphatic naphtha or LCM32-1087 Cleaner. Those surfaces shall then be wiped dry with an additional clean dry cloth. Do not allow the cleaner to air dry. Press the standoff in place orienting the length of the base vertically wherever possible.

CAUTION: The tacky surface of the double face tape shall not be touched by hands or fingers under any circumstances. If there is any question that a piece of the tape has been touched, it shall be discarded.

3.3.3.4 Stud passing through beam or frame. - See Figure IX for example. Obviously this method can be used only when holes exist in the beam or frame to accommodate the stud. Warning: Holes shall not be drilled in beams or frames to accommodate studs unless authorized by Design Engineering. The methods given in 3.3.3.1 and 3.3.3.2 shall be used if holes are not available.

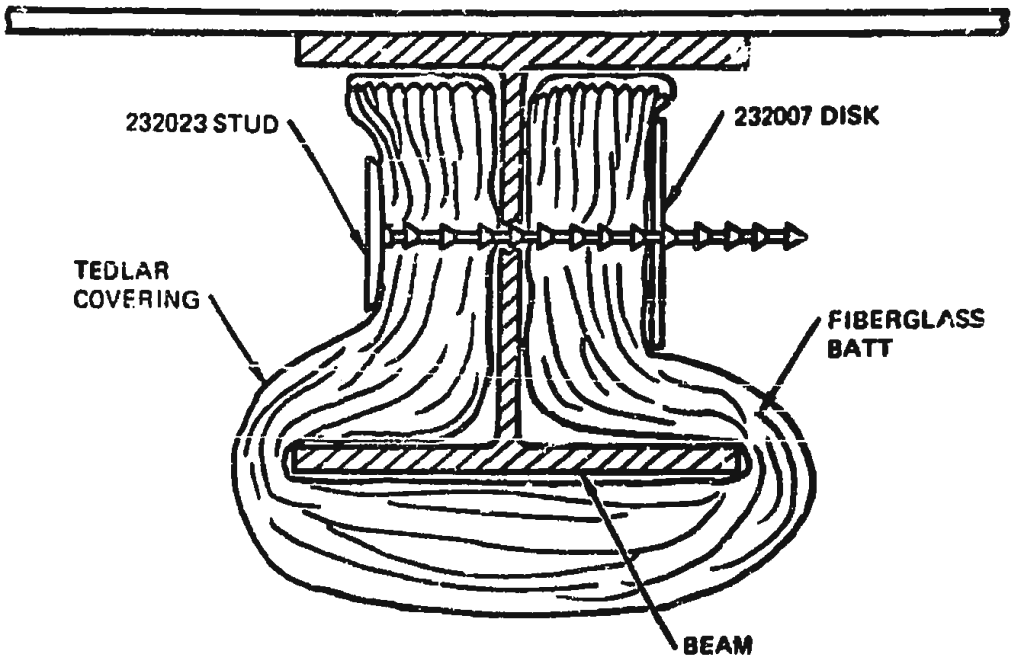

FIGURE IX

M1-0100-20-721

3.3.3.5 With some minor exceptions, all fiberglass batts shall be fastened in place by impaling them on studs as shown in the previous paragraphs. At least one stud shall be used for every six square feet of batt surface. Pressure sensitive tape (double or single face) may be used as an aid to hold corners, edges, etc, in place, but no batt shall be allowed to "hang" by its Tedlar cover held in place by tape only. The exceptions are as follows:

(a) The insulation batts below waterline 117 shall be supported by straps, as shown on the applicable engineering drawing, to prevent sagging. Studs and discs shall not be used to install batts below waterline 117, except when specified by the engineering drawing. Drain or vent holes are allowed only on the underside.

(b) Studs are not required on batts that are supported on all sides by rigid hardware, i.e., fuselage skin, frames, stringers, panels, etc. In such cases, pressure sensitive tape EPS 24. 1284 (double face) or EPS 24. 1510 (single face), may be used to hold the insulation in place during assembly of the hardware.

(c) In some areas of the airplane, especially in the flight station, the insulation must be installed in small pieces. Fiberglass batts of one-half square foot or smaller may be fastened in place permanently with EPS 24. 1284 or EPS 24. 1510 tape.

(d) Floor panel insulation batts shall be held in place using threaded spacers and discs as shown in Figure XI. The spacing shall be as shown on the applicable engineering drawing. Drain or vent holes are allowed only in the underside of the installed batts.

(e) In certain areas, skin surface build up causes the length of the insulation mounting stud to interfere with the sidewall trim panel installation. When possible, the stud should be relocated slightly to provide adequate clearance. When relocation is not practicable, the end of the stud shall be clipped to give clearance for the trim panel.

3.3.3.6 Along the sides of the airplane, between waterline 200 and waterline 267, all butt joints and shiplap joints between the fiberglass batts shall be covered with 2 inch wide EPS 24. 1510 Tedlar tape. Batts in this area may also be taped with EPS 24. 1510 Tedlar tape to any brackets, struts or other hardware which pass through the batts to effect the same kind of seal.

3.3.4 Installation with Velcro tape. - In some areas of the airplane, the Engineering drawing calls for the insulation to be installed with Velcro Hook and Pile tape. The Velcro tape shall meet Material Specification C-24-1256. Installation of the Velcro tape shall be in accordance with Process Specification LCP79-2029. LCM30-2084 adhesive may be substituted for the LCM30-2086 adhesive which is called out in LCP79-2029. The Velcro tape shall be adhesive bonded to metal or plastic parts. The Velcro tape shall be attached to insulation batts only by sewing.

3.3.5 Installation with adhesive. -In a few areas of the airplane the Engineering drawing calls for the batts to be glued into place, either to one another or to a supporting surface. The adhesive and method of bonding shall conform to LCP79-2061, Type 2. In all cases the adhesive shall be applied to the uncovered surface of the fiberglass.

3.3.6 Insulating struts and pipes. - Struts, pipes, long brackets etc., shall be insulated by wrapping with a blanket of fiberglass conforming to C-26-1277. The blanket shall be cut wide enough to form a longitudinal butt joint with itself when wrapped around the strut. In some areas, where a thin blanket (less than one inch thick) is called out, the insulation may be overlapped up to one inch along the longitudinal joint. The blanket shall be encased in Tedlar as described in 3.2, wrapped around the strut or pipe and taped into place with EPS 24, 1510 Tedlar tape. Strips of EPS 24, 1510 Tedlar tape shall be wrapped around the insulation at both ends and at intervals of 6 to 10 inches along the strut or pipe. Each strip shall be long enough to go completely around the insulation plus at least two inches. A strip of tape shall also be placed over the longitudinal butt or lapped joint.

3.3.7 Clearance for cables. - Insulation batts shall be secured to maintain clearance and prevent sagging or interference with control cables or torque tubes. Particular attention shall be taken to this requirement in the mid electric service center area. Tedlar (EPS 24, 1510) tape shall be used to secure the batts and ensure clearance.

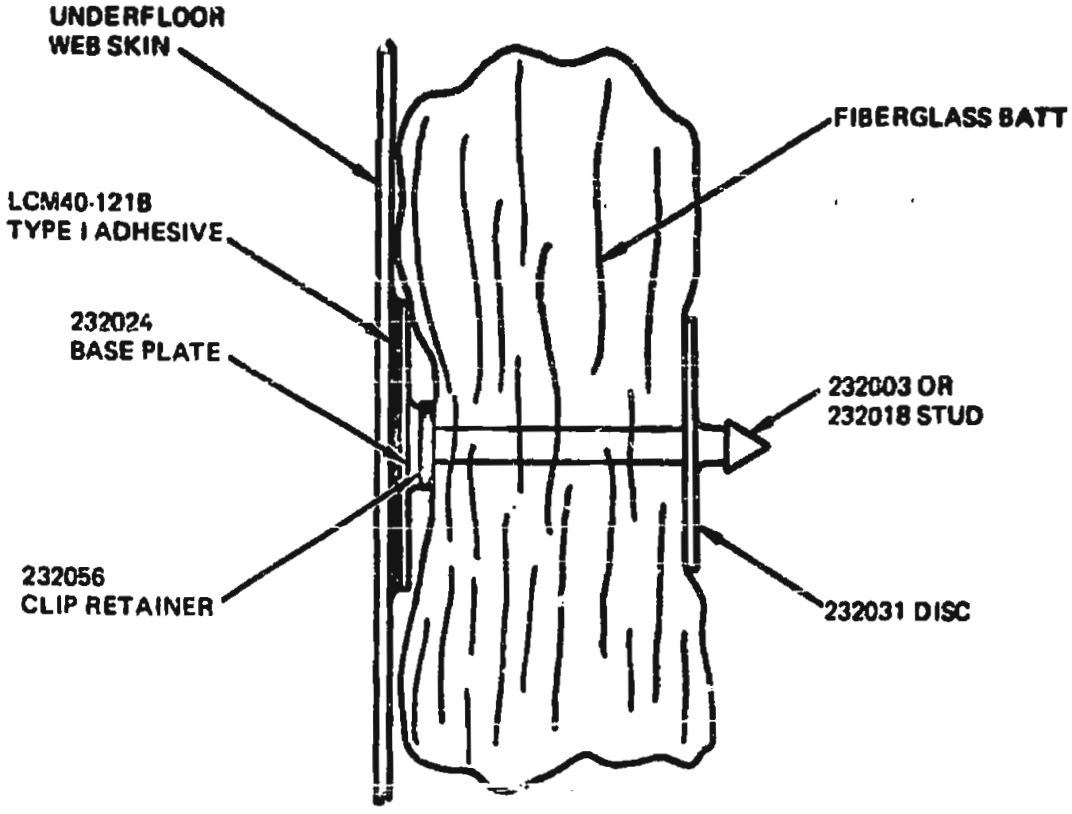

FIGURE X

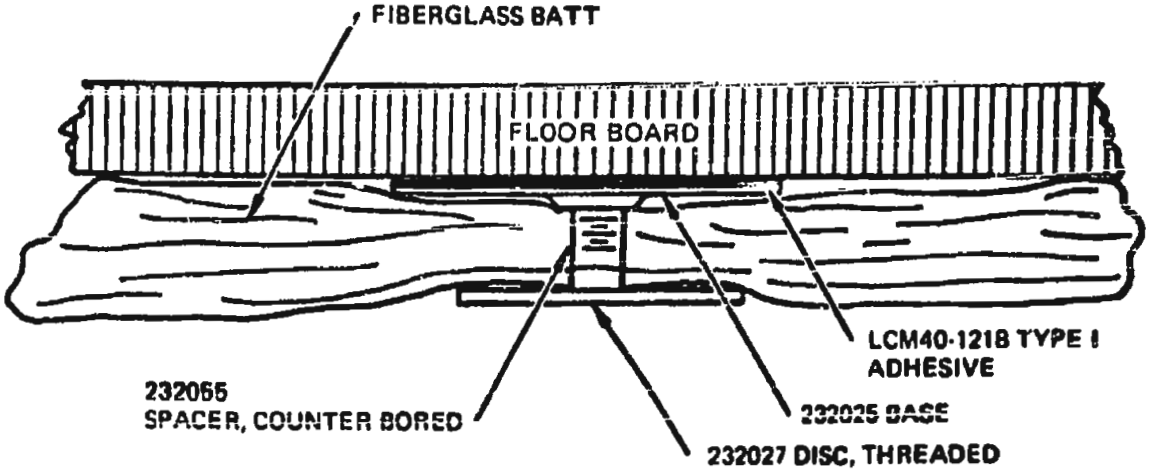

FIGURE XI

M1-0100-20-724

4. QUALITY ASSURANCE PROVISIONS

4.1 Assemblies and materials shall be inspected for conformance to the Engineering drawings and to the requirements of this bulletin. Method of inspection shall be visual.

5. PREPARATION FOR DELIVERY - Not applicable.

6. NOTES

6.1 This Process Bulletin exceeds the requirements of military specification MIL-S-6144A.

6.2 This Process Bulletin supersedes PB71-471A dated 7-21-71.

HONEYCOMB PANEL POTTED INSERTS - APPROVED REPAIRS

1. General

This procedure is applicable for replacement of threaded blind inserts in honeycomb panels with aluminum, phenolic, composite, or fiberglass facing skins.

2. Equipment and Materials

Cleaner - Federal Specification O-T-620; 1, 1, 1 Trichloroethane or equivalent

R Epoxy Resin, Thermofoam 3056, Tyep V111, Grade B, Class 1, or
R equivalent

3. Approved Repairs

A. Repair

NOTE: It is assumed that the insert adhesive bond has been
R broken and that the insert can be replaced without
R damage to the surrounding surface. If damage to the
R panel is evident, refer to the Structural Repair
R Manual for Honeycomb Standard Repairs, 51-50-07, or
R to "Fastener Installation and Removal", 51-40-01.

(1) Gain access to insert to be replaced.

(2) Remove original epoxy resin from hole in panel.

(3) Remove all loose material from hole.

(4) Clean interior area of hole and new insert, using clean cloth dampened with cleaner.

(5) Mix adhesive in accordance with manufacturers instructions.

NOTE: The adhesive is putty-like in consistency and will be applied in hole with small putty knife or equivalent. The Pot life of the adhesive mixture is approximately 5 minutes.

(6) Fill hole one-half to two-thirds full of adhesive.

(7) Install insert in hole with rotating motion to aid in filling voids.

NOTE: The outer surface of insert must be flush with panel skin.

(8) Fill remaining space in hole.

(9) Remove excess adhesive around insert, using clean cloth dampened with cleaner.

(10) Recheck to assure that insert is flush with outer surface of panel skin.

R (11) Allow epoxy to cure for 48-hours at 72 degrees F. to 82
R degrees F., or five hours at 115 degrees F. to 125
R degrees F.

(12) Install all removed or loosened panel fasteners.

R APPLICATION OF ADHESIVES - MAINTENANCE PRACTICES

APPLICATION OF ADHESIVES
L1011 AIRPLANE (LCP 79-2081)

1. SCOPE

1.1 This establishes the requirements and procedures applicable for the attachment of various non-structural metallic and non-metallic materials to themselves and to each other using adhesives.

1.2 Classification

1.2.1 The application of adhesives as specified herein are of the following types using the materials indicated:

Type 1	Buna-N rubber base adhesive
Type 2	Chloroprene, rubber base cement
Type 3	Reclaimed rubber base adhesive
Type 4	Silicone adhesive

Type 5	Polysulfide, extrudable, sealing compound (1)
Type 6	Limited flexibility epoxy cement
Type 7	Trim cement
Type 8	Fuel resistant vinyl trim cement
Type 9	Room-temperature setting wood adhesive
Type 10	Acrylic plastic cement
Type 11	Solvent methyl ethyl ketone (MEK)
Type 12	Fluorosilicone, adhesive-sealant
Type 13	Contact adhesive
Type 14	Vinyl acetate resin emulsion wood adhesive
Type 15	Adhesive, safety walk
Type 16	Silicone rubber sealant
Type 17	Film adhesive
Type 18	Rigid epoxy adhesive
Type 19	Polysulfide, brushable, sealing compound
Type 20	Polyurethane adhesive

2. APPLICABLE DOCUMENTS

2.1 The following documents form part of this specification to the extent specified herein:

SPECIFICATIONS

Federal

O-A-51	Acetone, Technical

(1) NOTE
See Maintenance Manual 28-11-00 for Sealing L-1011 fuel tanks

TT-M-261	Methyl-Ethyl-Ketone (For Use In Organic Coatings)
TT-N-95	Naphtha, Aliphatic
TT-T-548	Toluene, Technical
MMM-A-134	Adhesive, Epoxy Resin, Metal to Metal Structural Bonding
MMM-A-191	Adhesive, Room-Temperature and Intermediate-Temperature-Setting Resin (Phenol, Resorcinol, and Melamine Base)
MMM-A-193	Adhesive, Vinyl Acetate Resin Emulsion

Military

MIL-A-5092	Adhesive, Rubber Base, General Purpose
MIL-P-5425	Plastic Sheet, Acrylic, Heat Resistant
MIL-A-5433	Adhesive, Application of Room-Temperature and Intermediate-Temperature-Setting Resin (Phenol, Resorcinol, and Melamine Base)
MIL-W-6110	Wood: Determination of Moisture Content of
MIL-P-8184	Plastic Sheet, Acrylic, Modified
MIL-A-8576	Adhesive, Acrylic Base, for Acrylic Plastic
MIL-S-8802	Sealing Compound, Temperature-Resistant, Integral Fuel Tanks and Fuel Cell Cavities, High Adhesion
MIL-A-21366	Adhesive for Bonding Plastic Table Top Material to Aluminum
MIL-R-25134	Remover, Paint, and Lacquer, Solvent Type

Lockheed

LCM30-1247	Adhesive, Epoxy Resin Base, Non-Structural
LCM40-1218	Compound, Sealing, High Temperature Resistant, Quick Repair

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LCM30-2084	Cement; General Purpose Chloroprene
LCM30-2085	Adhesive – Sealing Compound, One Part, Room Temperature Vulcanizing
LCM30-2086	Cement – Trim, Vinyl
LCM30-2087	Cement – Trim
LCM40-2160	Compound, Sealing, Integral Fuel Tanks
LCM32-1087	Cleaner, Petroleum Base, for Primed Metals, Non-Photochemically Reactive
LCM41-1088	Dry Cleaning Solvent, Non-Photochemically Reactive

3. REQUIREMENTS

3.1 General Requirements

3.1.1 The type of adhesive to be used for cementing specific materials shall be as specified on the Engineering drawing.

3.1.2 Faying surfaces shall be free from burrs, waves, or other imperfections. Joing of faying surfaces shall be accomplished so as to avoid entrapping air. Surfaces shall be rolled, rubbed, or pressed to ensure good contact.

3.1.3 Adhesive primers, when required, shall be completely dry before the application of the initial adhesive coat.

3.1.4 Two coats of adhesive shall be applied to porous surfaces such as rubber, wood, leather, and fabric.

3.1.5 Surface Preparation

3.1.5.1 Solvent Cleaning – All foreign materials such as oil, wax, powder, and dirt shall be removed by wiping the surfaces with clean cloths saturated with TT-N-95, Aliphatic Naphtha, or LCM32-1087 solvent. Surfaces shall be wiped dry with additional clean dry cloths. Do not allow the cleaners to air dry. This cleaning treatment is not intended to remove paints or primers.

3.1.5.2 Paint Removal – Unless otherwise specified herein, the removal of paint finishes prior to bonding shall not be required unless otherwise specified on the Engineering drawing. MIL-R-25134, Paint Remover Compound, shall be used for removing lacquers, enamels, and epoxy finishes. Application and containment of the remover compound shall be limited to the areas being stripped. The remover compound shall be allowed to remain in contact with the painted surface until the paint film has wrinkled and loosened, usually 5 to 30 minutes. Removal of the loosened paint

and remover compound shall be accomplished by wiping the area with clean dry cloths. Any remaining residue shall be removed by wiping the surface with a cloth moistened with TT-N-95, Aliphatic Naptha, or LCM41-1088 solvent, and wiping dry with additional clean dry cloths.

3.1.5.3 Wood Surfaces – Wood surfaces shall be lightly sanded immediately prior to the application of the adhesive.

3.1.5.4 Rubber and Plastic Surfaces – Rubber and plastic surfaces, except the materials specified in 3.1.5.5, shall be roughened with a suitable abrasive and thoroughly cleaned with TT-N-95, or TT-M-261, Methyl-Ethyl-Ketone, or LCM41-1088 solvent.

3.1.5.5 Teflon, Kel-F, Tedlar, and Mylar Surfaces. – The bonding surfaces of plastics such as Teflon, Kel-F, Tedlar, and Mylar, require a special pretreatment prior to bonding. This surface treatment must be provided on the material as supplied, and must be specified on the drawing on which the material is called out.

3.1.6 Adhesive Preparation

3.1.6.1 Liquid Adhesive – Liquid adhesives shall not exhibit thickening, separation, precipitation or gelation.

3.1.6.2 Powdered Adhesives – Powdered adhesives shall not be caked or contaminated.

3.1.6.3 Solvent Reduction – Solvent reduction of adhesives using approved solvents is permitted if specified in the detail requirements.

3.1.6.4 Mixing – Mixing shall be done in clean, wax-free paper, polyethylene, aluminum or glass containers. All adhesives shall be thoroughly mixed prior to use. Two-part adhesives shall be mixed in the correct proportions. Covered containers used for mixing and dispensing shall not be coated with wax or other materials that would contaminate the adhesives. All containers shall be marked to indicate their contents, time of mixing, and the time the contents shall be discarded, if applicable.

3.1.7 Unless otherwise specified in the detail requirements of this specification the relative humidity shall be 20 to 85 percent and the temperature 60 to 100°F.

3.2 Detail Requirements

3.2.1 Type 1 Buna-N Rubber Base Adhesive – Type 1 bonding shall be performed using MIL-A-5092, Type III, Rubber Base Adhesive.

3.2.1.1 All faying surfaces shall be cleaned as specified in 3.1.5.

3.2.1.2 An even brush or spray coat of adhesive shall be applied to all surfaces to be joined.

3.2.1.3 The adhesive shall dry until it will adhere, but not transfer to the knuckle when lightly touched. Large adhesive – coated areas shall be reactivated by wiping with a cloth moistened with TT-M-261, Methyl-Ethyl-Ketone, within 25 hours after application.

3.2.1.4 The surfaces shall be joined with sufficient pressure to ensure complete contact. Care shall be taken not to entrap air within the adhesive bond line when surfaces are being joined.

3.2.1.5 The initial adhesive strength will be sufficient for ordinary handling. Maximum strength will be obtained after 3 to 5 days cure at 70°F.

3.2.1.6 Reduction of the adhesive viscosity shall be permitted using a blend of TT-M-261, Methyl-Ethyl-Ketone, and TT-T-548, Toluene.

3.2.1.7 Excess adhesive residue shall be removed by light wiping with a clean cloth moistened with TT-M-261, Methyl-Ethyl-Ketone.

3.2.2 Type 2 Chloroprene Rubber Base Cement – Type 2 bonding shall be performed using LCM30-2084 Chloroprene Base Cement

3.2.2.1 The cleaning, application, open time, reactivation, joining, initial strength, full strength requirements, and solvents for viscosity reduction and cleanup shall be as specified in 3.2.1.1, 3.2.1.2, 3.2.1.3, 3.2.1.4, 3.2.1.5, 3.2.1.6, and 3.2.1.7.

3.2.3 Type 3 Reclaimed Rubber Adhesive – Type 3 bonding shall be performed using MIL-A-5092, Type I, Reclaimed Rubber Adhesive.

3.2.3.1 Reduction of the adhesive viscosity shall be permitted using TT-N-95, Aliphatic Naphtha.

3.2.3.2 The cleaning, application, open time, joining, initial strength, and full strength shall be as specified in 3.2.1.1, 3.2.1.2, 3.2.1.3, 3.2.1.4 and 3.2.1.5.

3.2.3.3 Excess adhesive residue shall be removed by lightly wiping with a clean cloth moistened with TT-N-95, Aliphatic Naphtha, or LCM32-1087 cleaner.

3.2.4 Type 4 Silicone Adhesive – Type 4 bonding shall be performed using LCM30-2085, Type 1, Silicone Adhesive. Full cure is obtained after 48 hours at 70°F.

3.2.4.1 All faying surfaces shall be cleaned as specified in 3.1.5.

3.2.4.2 A coat of adhesive, 0.005 to 0.015 inch in thickness, shall be applied to each surface to be bonded.

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3.2.4.3 The surfaces shall be pressed or rolled into intimate contact sufficient to cause a continuous bead of adhesive to be exuded along the joint edge. Distortion of rubber parts with excessive pressure is prohibited.

3.2.4.4 The faying surfaces shall be held in contact for 2 hours, minimum.

3.2.4.5 Handling strength will be obtained after curing for 5 hours at 70°F.

3.2.5 Type 5 Polysulfide Sealing Compound -- Type 5 bonding shall be performed using MIL-S-8802, Class B; LCM40-2180, Type 1 or LCM40-1218, Type 1, Polysulfide Sealing Compound. (1)

3.2.5.1 All faying surfaces shall be cleaned as specified in 3.1.5.

3.2.5.2 The sealing compound base, and accelerator shall be mixed in the proportions recommended by the manufacturer. Additions of solvent are prohibited.

3.2.5.3 Apply an .005 to .015 inch thickness of mixed sealant to all surfaces to be joined.

3.2.5.4 A single layer of Scrim Cloth (CEPS L22.4611) may be used between the faying surfaces to maintain a minimum bond line thickness (see 6.3).

3.2.5.5 Surfaces coated with Type 5 sealant shall be joined immediately after application.

3.2.5.6 The parts shall be assembled using sufficient pressure to maintain complete contact and to cause a continuous bead of sealant to be exuded along the joint edge. Contact pressure shall be maintained until the sealant developes handling strength.

3.2.5.7 The adhesive material must be applied to the faying surfaces and the parts assembled and held together within the work life of the material. The adhesive is within its work life when it is capable of wetting the surface. The nominal work life of this material is defined as application time in Table 20 I. Handling strength and full cure are developed in the time shown in Table 20 I when the relative humidity is between 20 and 85 percent and the temperatue is as indicated.

(1) **NOTE**
See Maintenance Manual 28-11-00 for Sealing L-1011 fuel tanks

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TABLE 20 I – CURING CYCLES

Sealant	Application Time, Hours	Handling Strength, Hrs.		Full Strength, Hrs.	
		At 70 ± 10°F	At 130 ± 10°F	At 70 ± 10°F	At 130 ± 10°F
MIL-S-8802 Class B-1/2	1/2	10	2	48	10
LCM40-1218 Type I	1/4	3 – 4	2 – 3	24	4 – 5
MIL-S-8802 Class B-2	2	40	4	72	12
LCM40-2160 Type I	1	10 – 12	4	24 – 48	12

3.2.5.8 The use of premixed and frozen sealing compound is permissible (Ref. 6.2).

3.2.5.9 Uncured adhesive compound residue shall be removed by light wiping with a clean cloth moistened with TT-M-261 Methyl Ethyl Ketone.

3.2.6 Type 6 Limited Flexibility Epoxy Cement – Type 6 bonding shall be performed using LCM30-1247 epoxy cement.

3.2.6.1 All faying surfaces shall be cleaned as specified in 3.1.5.

3.2.6.2 The resin base and catalyst shall be mixed in the proportions recommended by the manufacturer. Additions of solvent are prohibited. Material shall be applied to the faying surfaces and the parts assembled and held together within the work life of the material. The adhesive is within its work life when it is capable of wetting the surfaces. The nominal work life of this material is one hour after mixing.

3.2.6.3 A uniform thickness of catalyzed cement shall be applied to all faying surfaces and assembled immediately after application.

3.2.6.4 Sufficient pressure shall be applied for 6 hours to maintain complete contact of all faying surfaces. A continuous bead of cement exuded along the joint edge is indicative of sufficient pressure. A single layer of Scrim Cloth (CEPS L22.4611) may be used between the faying surfaces to maintain a minimum bond line thickness (Ref. 6.3).

3.2.6.5 Full cure shall be obtained by curing for a minimum of 24 hours at 70 ± 10°F or by curing for a minimum of 1 hour at 200 ± 10°F. Full cure can be obtained by exposing the adhesive to a combination of ambient temperature and elevated temperature.

3.2.6.6 The use or premixed and frozen epoxy cement is permissible under certain conditions (Ref. 6.2).

3.2.7 Type 7 Trim Cement

3.2.7.1 Type 7 bonding shall be performed using LCM30-2087 trim cement.

3.2.7.2 All faying surfaces shall be cleaned as specified in 3.1.5.

3.2.7.3 An even brush or spray coat of Type 7 cement shall be applied to all surfaces, to be joined.

3.2.7.4 The coated surfaces shall be dried for 2 to 5 minutes or until the cement has an aggressive tack.

3.2.7.5 The surfaces shall be rolled or pressed together immediately to exclude all air bubbles.

3.2.7.6 The initial strength will be sufficient for normal handling. Full cure will be obtained after 48 hours minimum at 70°F.

3.2.7.7 Excess cement shall be removed with TT-N-95, Aliphatic Naphtha or LCM32-1087 Solvent.

3.2.8 Type 8 Fuel and Oil Resistant Vinyl Trim

3.2.8.1 Type 8 bonding shall be performed using LCM30-2088 Fuel Resistant Vinyl Trim Cement.

3.2.8.2 The cleaning, application, open assembly time, initial strength, and full cure shall be as specified in 3.2.7.2, through 3.2.7.6.

3.2.8.3 The cement shall be thinned, if necessary, with TT-M-261, Methyl Ethyl Ketone.

3.2.8.4 Excess cement shall be removed with TT-M-261, Methyl Ethyl Ketone.

3.2.9 Type 9 Room-Temperature Setting Wood Adhesive — Type 9 bonding shall be performed using MMM-A-181, Type I Grade B, Room Temperature Setting Wood Adhesive.

3.2.9.1 MIL-A-5433 bonding procedure may be used in lieu of Type 9 bonding procedure.

3.2.9.2 Atmospheric Conditions — Atmospheric control of the work and storage rooms shall be such as to maintain a temperature between 70 and 85°F and wood moisture content between 8 percent and 12 percent at the time of bonding. Wood moisture content shall be determined in accordance with MIL-W-6110.

3.2.9.3 Preparation of Adhesive — The adhesive shall be in accordance with the instructions furnished by the manufacturer. The ingredients shall be weighed and mixed with clean equipment and in clean containers to produce a smooth, workable adhesive mixture, free from lumps and entrapped air. Each batch of adhesive

shall be mixed in a clean container marked to indicate time of mixing. After the adhesive is once prepared, no water or other material shall be added. Unmixed adhesive that has been refrigerated shall be allowed to reach 65°F prior to mixing. Pot life of the catalyzed adhesive is 2 to 3 hours at 70°F.

3.2.9.4 Preparation of Parts – Parts shall be properly machined to ensure a good mechanical fit. Prior to bonding, all parts shall be prefitted and thoroughly cleaned of dust, dirt, wax, or grease. Parts shall be lightly sanded in the direction of the grain and glued within 8 hours. Moisture content of parts in the same assembly shall not vary more than 2 percent.

3.2.9.5 Application of Adhesive – The adhesive shall be applied to both surfaces to be bonded in sufficient quality to fill voids and spread evenly to obtain a full joint. An adhesive spreader shall be used where possible, equipped with spreading rolls and with control devices that permit the application of a uniform and controllable film. Brushes shall be used where mechanical spreading is impractical.

3.2.9.6 Assembly of Parts

3.2.9.6.1 Open Assemblies – A maximum time of 15 minutes shall be allowed after the adhesive application to complete assembly and apply pressure. For each 5° above 70°F the open assembly time shall be decreased by one minute.

3.2.9.6.2 Closed Assemblies – Surfaces that are joined immediately after the adhesive application shall have pressure applied to the joint within 60 minutes. For each 5° above 70°F the time until the application of pressure shall be decreased by 2-1/2 minutes.

3.2.9.6.3 Pressure – The pressure to be applied to assembled joints shall be as follows:

200 – 250 psi – High-density wood (Birch, Maple, Hickory, Oak)
150 – 200 psi – Intermediate-density wood (Douglas Fir, Walnut, Mahogany)
100 – 150 psi – Low-density wood (Spruce, Cedar)

The pressure shall not be removed or reduced until the adhesive has set. Relative movement of assembled parts shall be held to a minimum until the adhesive has set. The application of pressure by nailing shall be limited to plywood having a maximum thickness of 1/4 inch. The nails shall be spaced not more than 1 inch apart. When more than one row is necessary, the distance between rows shall not exceed 1/2 inch and the nails shall be staggered evenly in adjacent rows.

3.2.9.7 Curing of Adhesive – Non-stressed bond lines, such as flat parts of light construction cured at room temperature shall remain under pressure for 8 hours at 70°F. Stressed bond lines, such as curved parts where surfaces must be forced into contact cured at room temperature shall remain under pressure for 12 hours minimum, the nails shall be removed for at least 8 hours during which time the minimum temperature shall be 70°F.

3.2.9.8 Treatment of Bonded Parts After Bonding – Bonded members cured at ambient temperatures shall not be machined or roughly handled for 24 hours after the application of pressure. Bonded members cured at elevated temperatures shall not be machined or roughly handled until 1 hour after completion or curing.

3.2.10 Type 10 Acrylic Plastic Adhesive – Type 10 bonding be performed using MIL-A-8576, Type II, Acrylic Plastic Adhesive. This bonding procedure shall be limited to the bonding of MIL-P-5425, Acrylic Plastic, and MIL-P-8184 Acrylic Plastic.

3.2.10.1 The surfaces to be bonded shall be water sanded using 240 to 400 grit wet or dry sandpaper. The area around the surface to be bonded shall be protected by masking with cellulose tape (CEPS L24.1101).

3.2.10.2 The cement shall be prepared by mixing MIL-A-8576, Type II, Acrylic Plastic Adhesive in the proportions specified herein:

Component A (Base Cement)	– Viscous Liquid	118.3 Milliliters
Component B (Catalyst)	-- Powder in Capsule	2.4 Grams
Component C (Promoter)	– Liquid	5.0 Milliliters

Component B shall be dissolved in component A by stirring. This two component mixture shall be stored at 40°F or lower for not mor than 24 hours. Before using the cement 5 ml of component C shall be added and thoroughly mixed. The mixture shall be used within 30 minutes of mixing. The cement shall be applied to both surfaces and assembled immediately. The parts shall be held together in a jig while the cement cures. Pressure equal to but not exceeding that required to force out air bubbles shall be used.

3.2.10.3 The cement shall be cured for a minimum of 4 hours at a minimum of 70°F before handling. Joints that are to be machined shall be cured for a minimum of 24 hours at 70°F or a minimum of 4 hours at 158 ± 10°F. Full cure can be obtained by exposing the adhesive to a combination of ambient temperature and elevated temperature.

3.2.11 Type 11 Solvent Activation Bonding – Type 11 bonding shall be performed using TT-M-261, Methyl Ethyl Ketone.

3.2.11.1 All faying surfaces shall be cleaned as specified in 3.1.5.

3.2.11.2 The faying surfaces shall be activated just prior to bonding, by wiping with a cloth moistened with TT-M-261, Methyl Ethyl Ketone. The surfaces

shall be joined immediately by pressing firmly together. The surfaces shall be positioned properly during initial contact and air entrapment prevented.

3.2.11.3 Contact pressure will be applied to the mated parts by shotbags or other suitable means for 30 to 60 minutes. Full cure will be obtained by curing for a minimum of 48 hours at 70°F.

3.2.12 Type 12 – Fluorosilicone Rubber Adhesive Sealing Compound – Type 12 bonding shall be performed using LCM30-2085 Type II, Rubber Adhesive-Sealing Compound.

3.2.12.1 All faying surfaces shall be cleaned, as specified in 3.1.5.

3.2.12.2 A thin uniform brush coat of primer, silicone cement (CEPS L30.2250) shall be applied to all surfaces to be bonded except silicone rubber. The primer shall be dried for 30 minutes to 4 hours at 70°F prior to applying the adhesive. Primer material which has a milky appearance shall be discarded.

3.2.12.3 A coat of LCM30-2085 Type II, Rubber Adhesive, approximately 0.005 to 0.015 inch in thickness, shall be applied to all faying surfaces.

3.2.12.4 The surfaces shall be pressed or rolled into intimate contact sufficient to cause a continuous bead of adhesive to be exuded along the joint edge. Rubber parts shall not be distorted with excess pressure. The surfaces shall be held in contact for 2 hours.

3.2.12.5 Sufficient strength for handling will be obtained after 5 hours cure. Full cure will be obtained after curing for a minimum of 48 hours at 70°F.

3.2.13 Type 13 Contact Adhesive – Type 13 bonding shall be performed using MIL-A-21366, Contact Adhesive.

3.2.13.1 All faying surfaces shall be cleaned as specified in 3.1.5.

3.2.13.2 Brush, roll, or spray a uniform coat of adhesive on all surfaces to be bonded. Allow each coat of adhesive to air dry 5 to 30 minutes before applying an additional coat.

3.2.13.3 The assembly of parts coated with adhesive shall be performed by one of the following methods:

3.2.13.3.1 Open Time – The final adhesive coat on each surface shall dry until it is tacky but will not transfer to the knuckle when lightly touched. Surfaces to be joined shall be accurately positioned and carefully pressed together to ensure contact. Repositioning of joined surfaces is prohibited. Bonds, shall be completely forced into intimate contact by rolling enture bond area with a suitable roller.

3.2.13.3.2 Solvent Reactivation – The final adhesive coat on each surface shall be completely dry. Immediately before the surfaces are to be joined, one adhesive coated surface shall be wiped with a clean cloth moistened with TT-M-261, Methyl Ethyl Ketone. The faying surfaces shall be pressed together in such a manner as to prevent entrapping air. The mated surfaces shall be rolled or pressed to ensure uniform and intimate contact. If necessary, a small part of the surface shall be reactivated at one time, when bonding large areas. This operation shall be repeated until all surfaces are joined. Bonded surfaces shall be forced into intimate contact. Coated areas, kept clean, may be joined by solvent reactivation up to 30 days after application of the adhesive.

3.2.13.3.3 Heat Reactivation Method A – The final adhesive coat on each surface shall be dry. Heat shall be applied to the dried adhesive by lamps or oven until it becomes tacky. The surfaces shall be joined while the adhesive is hot. The joint shall be cooled to room temperature under pressure. Method B – the dry coated parts shall be assembled and 25 to 50 pounds per square inch (psi) applied. The bond line shall be heated to 250°F. Pressure shall be maintained until the assembly cools to room temperature. Prolonged heating at 250°F shall be avoided. Coated areas, kept clean, may be joined by heat up to 7 days after application of the adhesive.

3.2.13.4 Surfaces joined by open time or solvent reactivation methods will immediately develop sufficient strength for handling. Full cure requires 3 to 4 days at 70°F. Surfaces joined by heat will develop full strength immediately on cooling to 70°F.

3.2.13.5 If thinning is necessary for spray application, TT-M-261, Methyl Ethyl Ketone, shall be used.

3.2.13.6 Excess adhesive residue may be removed by lightly wiping with a clean cloth moistened with TT-M-261, Methyl Ethyl Ketone.

3.2.14 Type 14 Vinyl Acetate Resin Emulsion Adhesive – Type 14 bonding shall be performed using MMM-A-193, Vinyl Acetate Resin Emulsion Adhesive.

3.2.14.1 All faying surfaces shall be cleaned by sanding.

3.2.14.2 Moisture content of wood parts to be bonded shall be between 8 to 12 percent when determined in accordance with MIL-W-6110.

3.2.14.3 MMM-A-193, Vinyl Acetate Resin Emulsion, shall be applied to all surfaces to be joined at the rate of 225 square feet per gallon. Thinning if required shall not exceed 15 percent; 100 parts adhesive to 15 parts water by volume.

3.2.14.4 Adhesive coated parts shall be assembled immediately and pressure applied to the bonded surfaces. The time elapsing between application of the adhesive and subsequent bonding pressure shall not exceed 10 minutes. Pressure shall be applied by nails, screws, clamps, or hydraulic presses. The amount of pressure

required for assembly will vary. Pressures of 25 psi to 50 psi shall be sufficient for flat laminations and good fitting joints utilizing soft woods, whereas pressures of 120 psi to 175 psi shall be required for poor fitting joints or rough, hard woods. Sufficient strength for careful handling will be obtained after curing for two hours at 70°F. Full cure will be obtained after curing 72 hours at 70°F.

3.2.15 Type 15 Safety Walk Adhesive – Type 15 bonding shall be performed using Safety Walk Adhesive (CEPS L30.0831).

3.2.15.1 Type 15 adhesive shall not be applied over painted or primed surfaces. Paint coatings shall be removed from all faying surfaces in accordance with 3.1.5.2 prior to cleaning.

3.2.15.2 An even brush or spray coat of adhesive shall be applied to the smooth side of the walkway coating (CEPS L37.4835), and allowed to completely air dry for 5 to 30 minutes.

3.2.15.3 An even brush or spray coat of adhesive shall be applied to all other faying surfaces and allowed to air dry until the adhesive will adhere, but will not transfer to the knuckle when lightly touched. Immediately prior to assembly, an additional coat of adhesive, approximately one inch wide, shall be applied around the edges of the walkway covering.

3.2.15.4 Surfaces to be joined shall be accurately positioned and carefully pressed together. Repositioning of assembled surfaces shall not be permitted without repeating steps specified in 3.2.15.2 and 3.2.15.3. Assembled surfaces shall be forced into complete contact by rolling the entire bond area with a suitable roller.

3.2.15.5 Sufficient adhesive shall be squeezed out to form a continuous bead or fillet around the entire edge of the bonded area. Excess adhesive shall be removed by wiping with a clean cloth moistened with TT-M-261, Methyl Ethyl Ketone.

3.2.15.6 The initial adhesive strength obtained after assembly will be sufficient for handling. Maximum bond strength will be obtained after 3 to 4 days cure at 70°F.

3.2.15.7 Reduction of one adhesive viscosity shall be permitted, using a blend of TT-M-261, Methyl Ethyl Ketone, and TT-T-548, Toluene.

3.2.16 Type 16 Silicone Rubber Sealant – Type 16 bonding shall be performed using silicone rubber sealant (CEPS L40.2001). Full cure is obtained after 24 hours at 70°F or after 4 hours at 140°F.

3.2.16.1 All faying surfaces shall be cleaned as specified in 3.1.5.

3.2.15.2 The silicone rubber sealant base and accelerator shall be mixed in the proportions recommended by the manufacturer. Reduction of the adhesive viscosity shall be permitted using O-A-51, Acetone. The amount of Acetone added shall be limited to 5 percent by weight.

3.2.16.3 A thin uniform brush coat of primer, silicone adhesive (CEPS L30.2250) shall be applied to all surfaces to be bonded except silicone rubber. The primer shall be allowed to dry 30 minutes to 4 hours. Primer material which has a milky appearance shall be discarded.

3.2.16.4 A uniform coat of adhesive 0.005 to 0.015 inch in thickness shall be applied to each surface to be bonded.

3.2.16.5 The surface shall be pressed or rolled into intimate contact sufficient to cause a continuous bead of adhesive to be exuded along the joint edge. Distortion of rubber parts with excessive pressure is prohibited.

3.2.16.6 The faying surfaces shall be held in contact for a minimum of 4 hours.

3.2.16.7 Handling strength will be obtained after curing for 4 hours at 70°F.

3.2.16.8 Material shall be applied to the faying surfaces and parts assembled and held together within the work life of the material. The adhesive is within its work life when it is capable of wetting the surfaces. The nominal work life of this material is two hours.

3.2.16.9 Uncured adhesive residue shall be removed by lightly wiping with a clean cloth moistened with TT-M-261, Methyl Ethyl Ketone.

3.2.17 Type 17 Film Adhesive – Type 17 bonding shall be performed using film adhesive (CEPS L30.0561).

3.2.17.1 All faying surfaces shall be cleaned as specified in 3.1.5.

3.2.17.2 Joining of Laminated Secondary Substrate to Secondary Substrate By Heated Rotary Press Method – The adhesive film shall be attached to the secondary substrate by laminating the film and substrate in a heated rotary press. Joining to the primary substrate shall be in accordance with 3.2.17.3 or 3.2.17.4. The bond line temperature during lamination shall be 150 ± 10°F. The laminating rate shall be maintained on both the film and the substrate during lamination. If a rotary press is not available the film shall be attached to the secondary substrate with roller or hand pressure and laminated to the primary substrate in accordance with 3.2.17.4.

3.2.17.3 The primary substrate shall be preheated to 160 ± 10°F and the secondary substrate applied immediately using firm roller or hand pressure. Tension shall be maintained on the secondary substrate and held away from the primary substrate when being joined to the primary substrate. There shall be no air entrapment between the substrates.

3.2.17.4 Joining of Laminated Secondary Substrate to Primary Substrate by The Vacuum Bag Method -- The laminated secondary substrate shall be attached to the primary substrate using firm roller or hand pressure. Tension shall be maintained on the laminated secondary substrate and held away from the primary substrate while the roller pressure is applied. There shall be no air entrapment between the substrates. The assembled substrates shall be vacuum-bagged and a pressure of 20 inches of mercury maintained while the bond line temperature is brought up to 130 ± 10°F and then cooled to ambient temperature.

3.2.18 Type 18 Rigid Epoxy Adhesive -- Type 18 bonding shall be performed using MMM-A-134, Type I, Rigid Epoxy Adhesive.

3.2.18.1 The cleaning, mixing, application, assembly, and pressure application time shall be as specified in 3.2.6.1, 3.2.6.2, 3.2.6.3 and 3.2.6.4.

3.2.18.2 Material shall be applied to the faying surface and parts assembled and held together within the worklife of the material. The material is within its worklife when it is capable of wetting the surface. The nominal worklife of this material is 1/2 hour.

3.2.18.3 Full cure will be obtained by curing for a minimum of 7 days at 86°F or by curing for a minimum of 1 hour at 164 ± 10°F. Full cure can be obtained by exposing the cement to a combination of ambient temperature and elevated temperature.

3.2.18.4 The use of premixed and frozen epoxy adhesive is permissible under certain conditions (see 6.2).

3.2.19 Type 19 Polysulfide Sealing Compound -- Type 19 bonding shall be performed using C-40-775 Type II or C-40-778 Type II Polysulfide Sealing Compound. The application time shall be as selected by manufacturing.

3.2.19.1 All faying surfaces shall be cleaned as specified in 3.1.5.

3.2.19.2 The sealing compound base, and accelerator shall be mixed in the porportions recommended by the manufacturer. Additions of solvent are prohibited.

3.2.19.3 Apply a uniform thickness of mixed sealant to all surfaces to be joined.

3.2.19.4 A single layer of Scrim Cloth (CEPS L32.4611) may be used between the faying surfaces to maintain a minimum bond line thickness (see 6.5).

3.2.19.5 Allow solvent to flash off sealant for 15 to 30 minutes before assembling parts when C-40-775 Type II materials are used, and 10 to 15 minutes when C-40-778 Type II materials are used.

3.2.19.6 The parts shall be assembled using sufficient pressure to maintain complete contact and to cause a continuous bead of sealant to be exuded along the joint edge. Contact pressure shall be maintained until the sealant develops handling strength.

3.2.19.7 The adhesive material must be applied to the faying surfaces of the parts assembled and held together within the worklife of the material. The material is within its worklife when it is capable of wetting the surface. The nominal worklife of this material is defined as application time in Table I. Handling strength and full cure are developed in the time shown in Table I when relative humidity is between 20 and 85 percent and the temperature is as indicated.

3.2.19.8 The use of premixed and frozen sealing compound is permissible (see 6.2).

3.2.19.9 Uncured adhesive compound residue shall be removed by light wiping with a clean cloth moistened with TT-M-261 Methyl Ethyl Ketone.

3.2.20 Type 20 Polyurethane Adhesive – Type 20 bonding shall be performed using polyurethane adhesive (CEPS L30.2800).

3.2.20.1 All faying surfaces shall be cleaned as specified in 3.1.5.

3.2.20.2 A uniform coat of adhesive 0.005 to 0.015 inch thick shall be applied to each surface to be bonded.

3.2.20.3 The surfaces shall be pressed or rolled into intimate contact sufficient to cause a continuous bead of adhesive to be exuded along the joint edge. Distortion of rubber parts with excessive pressure is prohibited.

3.2.20.4 The faying surfaces shall be held in contact for a minimum of 4 hours.

3.2.20.5 Handling strength will be obtained after curing for 4 hours at 70°F.

3.2.20.6 Material shall be applied to the faying surfaces and parts assembled and held together within the worklife of the material. The adhesive is within its worklife when it is capable of wetting the surfaces. The nominal worklife of this material is ½ hour.

3.2.20.7 Uncured adhesive residue shall be removed by lightly wiping with a clean cloth moistened with TT-M-261, Methyl Ethyl Ketone.

3.2.20.8 Full cure is obtained by curing for 48 hours at 70 ± 10°F or by curing for 3 hours at 150 ± 10°F.

4. QUALITY ASSURANCE PROVISIONS

4.1 An effective quality control system shall be provided to ensure compliance with the requirements of this specification.

5. HANDLING AND TRANSPORTATION

5.1 Material and parts shall be handled and protected as necessary to preserve the physical characteristics in good condition.

6. NOTES

6.1 In cases where it is not practicable to maintain the pressure for 24 hours, the pressure may be released immediately after initial complete contact is assured.

6.2 Two part sealing compounds and epoxy adhesives specified in 3.2.5, 3.2.6, and 3.2.18, may be pre-mixed, quick frozen in a container sealed to prevent the entry of contaminating media, and stored at -20°F or below for maximum period of ten days. Immediately prior to use, the sealing compound or adhesive shall be quick thawed to a temperature within 10°F of ambient while still in the sealed container. Quick freezing and quick thawing shall be defined as follows:

Quick Frozen – a condition where the sealant or adhesive temperature is reduced from ambient to -20°F or below within 10 minutes.

Quick Thawed – a condition where the sealant or adhesive temperature is raised from -20°F to within 10° of ambient within ten minutes.

Containers shall be marked to identify the material by specification number, manufacturer's batch number and date of mixing and freezing.

6.3 Scrim Cloth (CEPS L22.4611), weighing 1.5 ounces per square yard, may be used to ensure a uniform coating of adhesive in the joint.

6.4 The following cross-reference list of adhesive types of LCP79-2061 meet or exceed the corresponding adhesive types of Calac 0101 including Amendment No. 1.

LCP79-2061	Calac 0101
1	i
2	II
3	III
4	IVb
5	V, Vb, Vd, Vf
6	VI, VIb, VIc
7	VII
8	VIII
9	IX
10	X
11	XI
12	XII
13	–
14	–
15	–
16	IV
17	–
18	–
19	Va, Vc, Ve, Vg
20	–

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R

STANDARD PRACTICES - WINGS

R 1. General

R Standard practices pertaining to the wing are contained in this
R section.

CAPTIVE SCREWS - REMOVAL AND INSTALLATION

1. General

Captive screws are used for the attachment of various access panels on the L-1011 airplane.

2. Equipment and Materials

Stud installation tool H7503-X (for standard lead thread screws)

CR Spacer tool TK 7525 needed for screws longer than 4.5

Anvil and punch tool set RNT 7910-X (for removal of flush or protruding head screws)

NOTE: The X in the tool number indicates thread size as follows:

4 = 0.1120-40

6 = 0.1380-32

8 = 0.1640-32

CR 10 = 0.1900-32

12 = 0.2500-28

All tools are available from Deutsch Fastener Corporation (FSCM 08524).

3. Removal/Installation

A. Removal - Metallic Sheet Panels

(1) Gain access to back side of panel.

(a) Remove panel screws.

(b) If screw/screws are damaged and cannot be removed, drill heads.

(2) Position anvil (back-up block) on screw head side of panel, assuring that hole in anvil does not overlap retainer sleeve.

(3) Place punch over thread end of screw, so that punch rests against shoulder inside sleeve.

(4) Strike punch with hammer to remove sleeve and screw (if screw is still installed).

NOTE: This action unswages the sleeve and forces it out. The screw (if present) will be driven into the anvil.

(5) Remove rivets, then remove damaged nut.

B. Remove - Non-Metallic Sheet

(1) Cut through screw to separate threaded end from head. Remove screw.

(2) Using a spotface cutter, remove swaged portion of sleeve.

(3) Drive sleeve out of surface sheet.

(4) Remove rivets, and then remove nut.

C. Installation

(1) Prepare surface and substructure sheets in accordance with the requirements of Figure 401. For curved panels, counterbore depth shall meet requirements at the shallowest point.

(2) Insert correct size stud into surface sheet in accordance with requirements of Figure 402.

(3) Using applicable installation tool, turn tool onto screw until flush with sleeve.

(4) Squeeze handle of installation tool to swage sleeve.

(5) Unthread tool from stud.

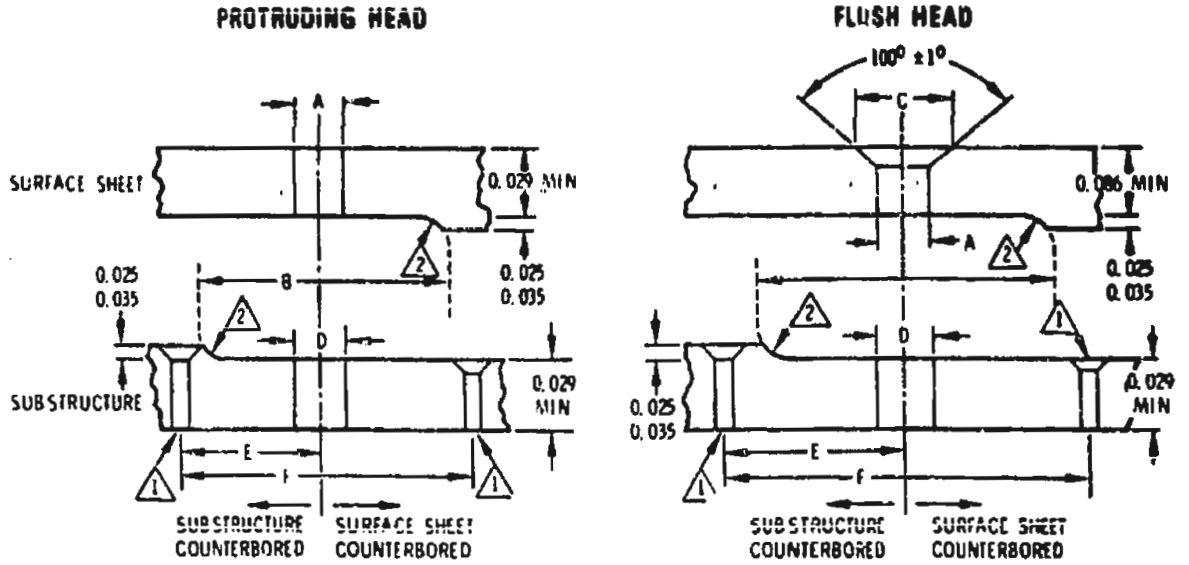
(6) Attach nut to substructure sheet with rivets.

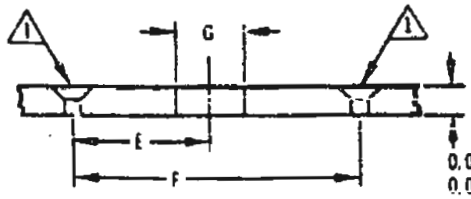
CR NOTE: Captive screws on the wing and empennage are
CR frequently damaged. At line station, if time
CR does not permit replacement of captive screws,
CR remove damaged assembly and install Phillips or
CR Tri-wing screws, use NAS 517, NAS 4403, NAS 7103
CR or equivalent.

CR At major base visits all "interim" captive and
CR damaged captive screws must be replaced with

CR original Tri-wing captive screws.

CR Deutsch Part Number DLMC 7900 captive screws are
CR also installed with H-7503-X stud installation
CR tools.





NOTE

1. $^{0.096}_{0.103}$ DIA (NO. 401 HOLE CSK FOR 3/32 RIVETS FLUSHNESS $^{+0.000}_{-0.006}$
2. $^{0.092}_{0.062}$ R

THREAD SIZE	A DIA	B DIA COUNTERBORE	C DIA	D DIA	E	F	G DIA
0.1120-40	0.186 0.191	0.417 0.467	0.215 0.225	0.172 0.178	0.339 0.349	0.686 0.690	0.311 0.318
0.1380-32	0.212 0.217	0.417 0.467	0.335 0.345	0.198 0.204	0.339 0.349	0.686 0.690	0.331 0.336
0.1640-32	0.227 0.232	0.448 0.498	0.340 0.350	0.227 0.233	0.339 0.349	0.686 0.690	0.347 0.354
0.1900-32	0.256 0.261	0.448 0.498	0.380 0.390	0.249 0.255	0.339 0.349	0.686 0.690	0.374 0.381
0.2500-28	0.322 0.327	0.542 0.592	0.409 0.419	0.311 0.318	0.495 0.505	0.998 1.002	0.437 0.444

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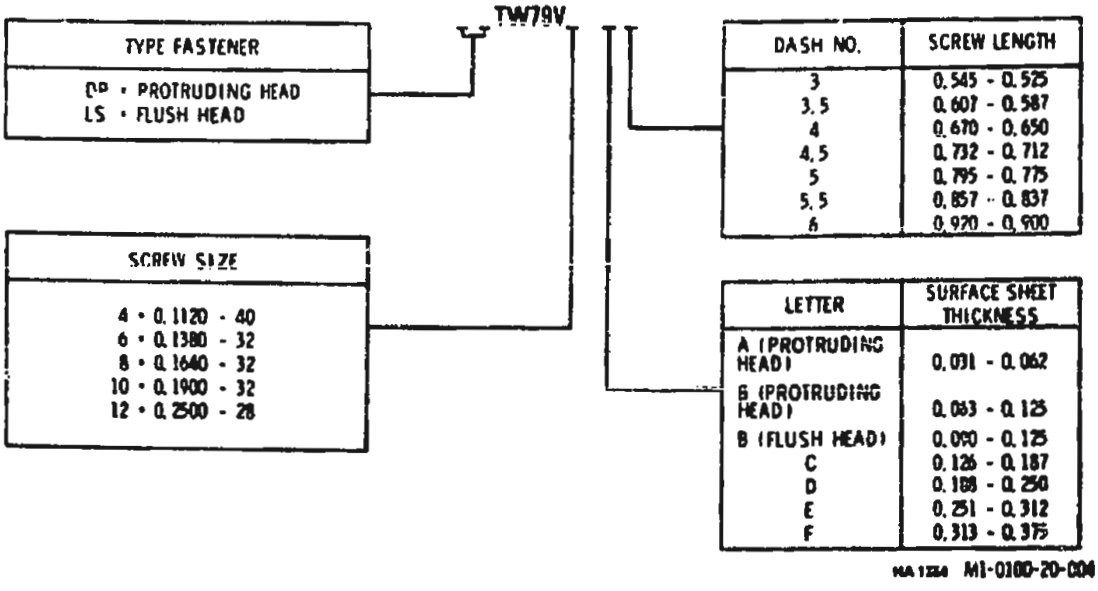
Captive Screw Sheet Preparation
Figure 401



Captive Screw Selection
Figure 402

TAPERED THREADED BUSHING AND NUT WITHIN NUT REMOVAL AND INSTALLATION

1. General

Tapered threaded bushings and nuts within nuts are used in the L-1011 airplane where resistance to fatigue is desired.

2. Equipment and Materials

Knock-out tool No. TLA4150-6

Gage No. TLG5130-1

These tools are available from Omark Industries (FSCM 85495).

3. Removal/Installation

A. Removal

(1) Remove nut within nut.

(2) Thread knock-out tool No. TLA4150-6 on bushing.

(3) Tap end of knock-out tool with a light hammer to drive bushing out of hole.

(4) Remove knock-out tool from bushing.

B. Installation

(1) Prepare hole (Ref. Fig. 401).

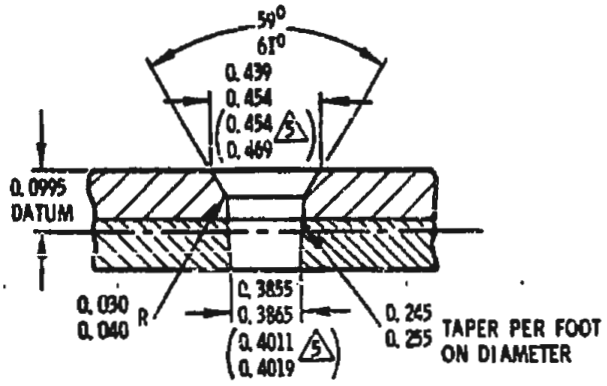
(2) Insert correct size bushing into hole using finger pressure only (approximately 10 to 30 pounds).

(3) Check protrusion of bushing head from structure. Use of gage, No. TLG5130-1, will facilitate this check. Protrusion must be 0.115 to 0.259 inch. If hole is oversize, use oversize bushing.

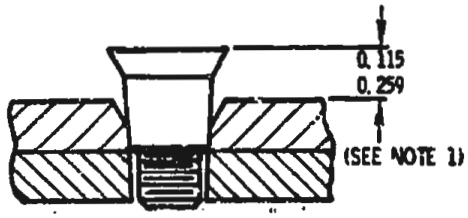
CAUTION: COMPRESSION RIVETER YOKE MUST CLEAR THREADED PORTION OF BUSHING.

DO NOT DRAW BUSHING INTO HOLE BY WRENCHING THE MATING NUT.

(4) Press bushing into hole using a compression riveter.

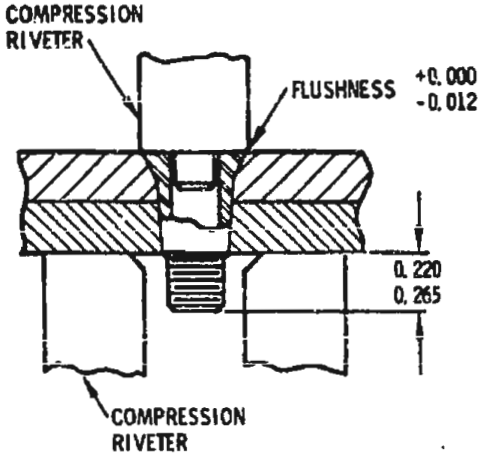


1. HOLE PREPARATION

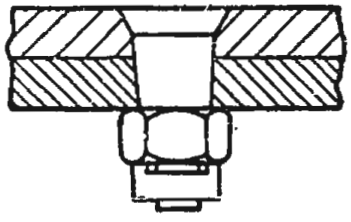


BUSHING INSTALLED IN HOLE
WITH FINGER PRESSURE
(APPROXIMATELY 10 TO 30 POUNDS)

2. HOLE GAGING



3. BUSHING INSTALLATION



4. INSTALLATION OF NUT WITHIN NUT ON INSTALLED BUSHING

BUSHING GRIP DASH NO. (LAST 2 DIGITS)	NUT INSTL TORQUE (LB INS)
04 AND 05	60 - 80
06 AND 07	70 - 90
08 AND 10	80 - 100
11 THRU 20	90 - 130

NOTE

1. GAGING MAY BE FACILITATED BY USING GAGE NO. TLG5130-1 AVAILABLE FROM OMARK INDUSTRIES (FSCM 85495).
2. INSTALL BUSHINGS AND NUTS WITH SEALING COMPOUND LCM40-2121 (PR 1431 G) OR EQUIVALENT.
3. PRESS BUSHING INTO HOLE WITH A COMPRESSION RIVETER WITH A YOKE WHICH WILL CLEAR THREADED PORTION OF BUSHING. DO NOT DRAW BUSHING INTO HOLE BY WRENCHING THE MATING NUT.
4. BUSHING GRIP DASH NO. (LAST 2 DIGITS) DESIGNATES GRIP THICKNESS IN 1/32-INCH INCREMENTS.

5 THESE DIMENSIONS APPLY TO INSTALLATION OF LS35145 OVERSIZE BUSHING.

HA 1633
M1-0100-20-005

R R R Tapered Threaded Bushing and Nut Within Nut Removal and Installation
Figure 401

R R EFFECTIVITY: ALL

050

R (5) Install nut within nut. Tighten to proper torque value
R as shown in Figure 401.

R AIRCRAFT APPEARANCE - MAINTENANCE PRACTICES

R 1. Maintenance Practices

R A. General

R This section defines equipment, materials, and procedure for
R cleaning of ceilings walls, PSM placards, and polycarbonate
R plastic moldings.

R B. Cleaning Precautions

R Many commercial cleaning products are harmful or toxic to
R humans and harmful or corrosive to metal and other materials
R on the aircraft. Therefore, use only approved products in
R the correct manner for which they were intended.

R C. Tools and Equipment Required

R Proper handling of materials and supplies is required. Good
R judgement must be exercised to ensure that waste is kept to
R a minimum.

R Interior Cleaning Chemicals
R Table 201

MATERIAL	TYPE	MIX	SOURCE
Detergent	High Concentrate 40-1	One part cleaner to 10 parts water or in accordance with manufacturer's instructions	American Lincoln, Toledo, Ohio
	Spray White E		Kelite Corp., Berkley Heights, N.J.
	Clean Quick		Proctor and Gamble Cincinnati, Ohio
	Do all		Cemithon Corp., Seattle, Washington

Interior Cleaning Chemicals (Cont)
Table 201

MATERIAL	TYPE	MIX	SOURCE
	Y-999		Yosemite Chemical Co., Los Angeles, Calif.
	Burlin 815 MX		Brulin Co. Inc. Indianopolis, Ind.
Liquid Cleaner	Federal Specification P-P-560, Type I, or Equivalent		
Wiper	Gauge, cheesecloth, cotton cloth, or sponge (Do not use any reclaimed or previously used materials)		

D. Cleaning Procedure

CAUTION: DO NOT APPLY AMMONIATED CLEANERS TO PASSENGER SEAT IDENTIFICATION PLACARD HOLDERS.

(1) Apply the solution to the surface with spray, wash bottle, or dampened wiper. Allow solution to remain on the surface for a period of up to 2 minutes or as recommended by the manufacture. A medium fiber brush may be used in recessed areas where necessary.

(2) Surface shall be wiped clean using a wiper dampened with clean water, then rinsed with a clean wiper saturated with clean water, then dried with a clean wiper. The procedure may be repeated as often as necessary until the surface is clean.

(3) Liquid cleaner (alternate) apply liquid plastic cleaner, P-P-560 Type I, to the surface using a clean dry wiper. Allow to dry (4 to 10 minutes) then wipe with another clean dry wiper to remove residue. This procedure may be repeated as necessary.

R AIRCRAFT APPEARANCE - EXTERIOR WASHING MAINTENANCE PRACTICES

R 1. General

R An exterior wash will be required:

R When established interval since last wash is exceeded.

R Upon receipt of a complaint.

R A minimum period of six hours, separate from other ground
R activities, is required for line aircraft washing.

R 2. Equipment and Materials

R Abrasive pads

R Mops and handles

R Buckets

R Garden sprayer with concentrated cleaner

R Water

R Rain gear (boots, gloves, pants, coat and face shield)

R Stand (platform)

R Hose with nozzle (Adjustable for fan spray)

R Dispenser for application of detergents

R Protective cover for static vent, cabin compressor inlet and
R wheels

R 3. Reference Procedure

R	10-10-00	Parking and Mooring
R	12-11-11	Aircraft Fueling and Grounding
R	21-31-00	Cabin Pressurization
R	24-00-00	Electrical Power
R	27-51-00	Trailing Edge Wing Flaps

R 52-11-00 Passenger Doors

R 52-31-00 Cargo Doors

R 4. Maintenance Practices

R A. Preparation

R (1) Assemble needed equipment and materials.

R NOTE: Landing gear will be washed upon request of
R supervisor.

R CAUTION: LANDING GEAR MUST BE LUBRICATED AFTER WASHING
R (REF. 12-24-00).

R (2) Ground the aircraft (Ref. 12-11-11).

R (3) Lower wing flaps for cleaning (Ref. 27-51-00) and close
R pressurization outflow valve. (Ref. 21-31-00).

R (4) Close all windows and doors (Ref. 52-11-00 and
R 52-31-00).

R (5) Install static port covers, attach red streamers (Ref.
R 10-10-00).

R CAUTION: ELECTRICAL POWER MUST NOT BE APPLIED TO AN
R AIRCRAFT DURING WET WASH OF FUSELAGE EXTERIOR.

R (6) Turn off electrical power (Ref. 24-00-00).

R B. Exterior Washing

R CAUTION: ALWAYS USE FOG SPRAY RATHER THAN A STREAM.

R DO NOT DIRECT HIGH PRESSURE STREAM TOWARD ANY
R FIBERGLASS PANEL OR CABIN WINDOW.

R NEVER DIRECT WASHING OR RINSING SOLUTION TOWARD
R ILLUSTRATED AIRCRAFT OPENINGS (Ref. Fig. 201).

R AVOID CONTACT OF FIBERGLASS PANELS, ANTENNAS AND
R PITOT TUBES WITH SUCH RIGID MATERIALS AS MOP
R HANDLES AND SPRAY NOZZLES.

R DO NOT USE ABRASIVE PADS OR MATERIALS ON WINDOWS.

R DO NOT SPRAY OR CAUSE DETERGENT AND WATER TO SPRAY
R TO ENTER ENGINE AIR INTAKES.

R DO NOT DIRECT FOAM OR RINSING WATER ONTO FLAP,
R SLAT OR SPOILER MECHANISMS.

R DO NOT SPRAY DIRECTLY INTO ENGINE JET PIPES OR
R DEICING LOUVERS ON WINGS, FIN AND TAILPLANE.

R DO NOT DIRECT AIRCRAFT CLEANER OR RINSING WATER ON
R CABLES, CABLE PULLEYS, BEARINGS, CABLE DRUMS, OR
R STATIC VENTS.

R WHEN USING FLAMMABLE LIQUIDS FOR AIRCRAFT
R CLEANING, GROUND POWER UNIT (GPU) MUST BE
R DISCONNECTED AND REMOVED FROM VICINITY OF AIRCRAFT
R AND AIRCRAFT BATTERY CABLES MUST BE DISCONNECTED
R AND PROPERLY STOWED.

R (1) Wash aircraft fuselage and empennage.

R NOTE: Wash lowest part of aircraft working toward top
R to prevent streaking. Also cool off hot
R surfaces by wetting to prevent streaking.

R (a) Start at tail on left side of aircraft to nose,
R then wash right side back to tail.

R CAUTION: STORE CLEANING TOOLS OFF FLOOR TO PREVENT
R ABSORPTION OF GRIT AND SAND. DO NOT USE PAD
R ON WINDOWS. THE PAD MAY SCRATCH WINDOWS.

R (b) Apply cleaner by foam preferably or with a pad
R from a bucket of solution.

R (c) Rinse aircraft throughly with fog spray before
R cleaning solution dries.

(d) For removal of extremely difficult film build-ups or marks, apply cleaner with abrasive pad until removed. Rinse with water.

(e) For grimy sludge build-ups, e.g., on underside of fuselage around gear areas, apply concentrated cleaner with sprayer, allow to set for several seconds, then agitate and rinse.

(2) Wash wings, Engine Pylons, Flap and Gear Area.

CAUTION: IF SLAT OR FLAP AREAS ARE WASHED, SYSTEMS MUST BE RELUBRICATED (Ref. 12-23-00).

(a) Start at lower portion of fuselage and proceed along right wing to tip, then wash top of wing back to fuselage.

(b) Repeat process for left wing.

(c) Rinse aircraft throughly with fog spray before cleaning solution dries.

(3) Clean windows, landing and taxi lights.

(a) Clean windows and lights with solution of cleaner and long handlged mops or cloths.

NOTE: Ensure mops and cloths are free of foreign matter which might scratch windows.

C. After Washing

(1) Remove static port covers, tidy area and secure materials and equipment.

NOTE: After removing moisture resistant tapes, ensure all traces of moisture and adhesive are cleaned off surrounding areas of static ports.

(2) Check all control seals and control surfaces to ensure water has completely drained.

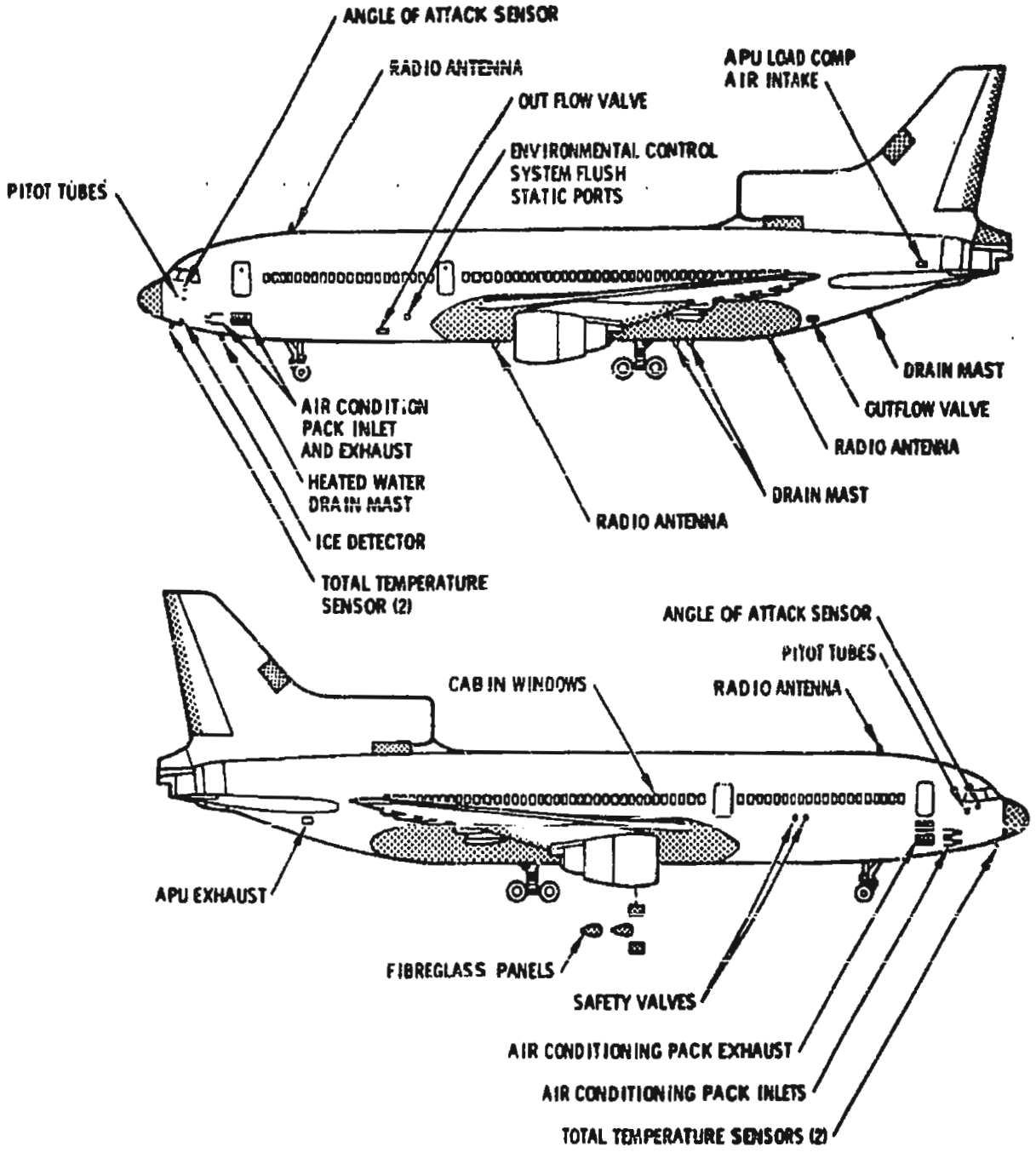
(3) Check main and nose gear downlock mechanism to ensure rinse water has not accumulated or mixed with grit.

(4) Inspect nose and main gear doors for cleanliness and adequate lubrication.

CAUTION: DO NOT USE FORCED AIR TO HASTEN THE DRYING.

R (5) Ensure all traces of moisture are completely dried from
R static vent orfices and vent plates, ensure orifices
R are not obstructed.

R (6) Open ground service panels to check for trapped water.
R Reclose panels.



FIBREGLASS

AIRCRAFT POSSIBLE DAMAGE AREAS

M1-0000-20-803

R R Aircraft Exterior Washing
Figure 201

R R 0018 EFFECTIVITY: ALL

R CLEANING PROCEDURES FOR INTERIOR DECORATIVE SURFACES

R 1. Description and Operation

R A. General

R Cleaning materials, equipment and procedures for cleaning
R interior decorative surfaces of the cabin, flight station
R and galley are located in this section.

R 2. Equipment and Materials

R Detergent - American-Lincoln, Toledo, Ohio or equivalent

R Liquid cleaner - P-P560, Type I - Permatex Co. Inc. or
R equivalent

R Solvent - Freon TF - E.I. DuPont de Nemous or equivalent

R Solvent - Inhibisol - Penetone Co., Tenafly, N.J. or equivalent

R Solvent - Chlorothene - Dow Chemical Co., Midland, Michigan or
R equivalent

R Glass cleaner - Glyst concentrated glass cleaner - Turco
R Products, Los Angeles, California or equivalent

R Cleaning compound, dry - Hose Dry cleaning Compound - Host of
R California, Pasadena, California or equivalent

R Cleaning compound, dry - Rug Cleaner 3-A-Tec Chemical Co.,
R Monterey Park, California or equivalent

R Vinyl Cleaner - Flite Cleaner - Flite Chemical Co., Van Nuys,
R California or equivalent

R Clear water - Tap water - Local

R Wiper - Cheesecloth, gauze, cotton cloth or sponge - Local

R Squeeges - Water remover - Local

R Brush-Lint - Upholstery - Local

R Sink Plunger - Cleaning Sink drains - Local

R Brush - Scrubbing - Spot removal and panel cleaning - Local

R Sponge Mop - Cleaning walls and ceilings - Local

R Brush - Round - Lavatory Bowls - Local

R Bone Scraper - General cleaning - Local pharmaceutical supply
R (Ref. Figure 201) or equivalent

R Vacuum - Carpet Sweeping - Local

R Bucket - Plastic - General aircraft cleaning use - Local

R Vacuum cleaner - General cabin cleaning - Local

R Rags - General cabin cleaning - Local

R Sponges - General cabin cleaning - Local

R 3. General Cleaning Practices

R A. Cleaning (General)

R CAUTION: MANY COMMERCIAL PRODUCTS ARE HARMFUL OR TOXIC TO
R HUMANS AND HARMFUL OR CORROSIVE TO METAL AND OTHER
R MATERIALS ON THE AIRCRAFT. USE ONLY APPROVED
R PRODUCTS IN CORRECT MANNER FOR WHICH THEY WERE
R INTENDED.

R (1) Prior to starting any cleaning procedure herein, remove
R excess soil by blotting, vacuuming or by placing clean
R dry wiper over soiled area and pinching.

R NOTE: Take care not to spread soil or work it further
R into surface.

R (2) Mix detergent in ratio of one part
R detergent to ten parts water or in accordance
R with manufacturer's instructions. Apply
R solution to surface with spray, wash bottle or
R dampened wiper. Allow solution to remain on
R surface up to two minutes or as recommended by
R manufacturer.

R NOTE: Use medium fiber brush in recessed areas where
R necessary.

R (3) Wipe surface clean using wiper dampened with clear
R water, then rinse with clean wiper saturated with clear
R water and wipe dry with clean dry wiper.

R (4) Apply liquid plastic cleaner to surface of unpainted
R thermoplastics only, using clean dry wiper. Allow to
R dry (four to ten minutes) remove residue with another

R clean, dry wiper. Procedure may be repeated as
R necessary.

R (5) Vinyl surfaces present particularly difficult cleaning
R problem. If detergent cleaning does not work, apply
R vinyl cleaner in accordance with manufacturers
R instructions.

R NOTE: Take precaution not to contaminate adjacent
R surfaces.

R CAUTION: CARE IS REQUIRED USING BONE SCRAPER TO PREVENT
R DAMAGE TO FABRIC.

R (6) Spots caused by coffee, tea, milk, soft drinks,
R alcholic beverages, fruits or fruit juices, catsup,
R syrup, perfumes, vomit, urine and similar materials
R soak with cold or lukewarm water and while damp, work
R with bone scraper (Ref. Fig. 201). Blot area dry with
R clean wipers or paper towels.

R (7) Mix detergent in ratio of one part detergent to five
R parts water or in accordance with manufacturer's
R instructions and sprayed onto soiled area. Work
R detergent into foam by gently scraping with bone
R scraper.

R (8) Remove foam with bone scraper and blot with wipers to
R remove moisture. Brush pile on carpets with soft fiber
R brush to straighten and lift pile.

R CAUTION: CARE IS REQUIRED USING BONE SCRAPER TO PREVENT
R DAMAGE TO FABRIC.

R (9) If soil or oder persists, spray solution of sodium
R bicarbonate (one teaspoon to six ounce water) onto
R soiled area and gently scraped with bone scraper. Blot
R dry area with clean wipers or paper towels.

R (10) Clean soils caused by fresh paint, grease, oils, jet
R fuel, hydraulic fluids, powdered graphite, aluminum,
R inks, lipstick and similar materials by mixing
R detergent and applied as specified in Step 3A(7).
R Allow to soak for approximately 30 seconds and then add
R small amount of solution. Work fibers gently with
R blunt end of bone scraper.

R (11) Pick up foam with bone scraper and blot area with paper
R towels or wipers to remove residual moisture.

R (12) Re-apply detergent solution and rework fibers with bone
R scraper until all traces of soil are removed. Blot

R excess moisture until surface is dry. Brush pile on
R carpets with soft fiber brush to straighten and lift
R pile.

R WARNING: SOLVENTS ARE INFLAMMABLE.

R CAUTION: MANY COMMERCIAL SOLVENTS ARE HARMFUL OR TOXIC TO
R HUMANS AND HARMFUL OR CORROSIVE TO METAL AND OTHER
R MATERIALS ON THE AIRCRAFT. USE ONLY APPROVED
R PRODUCTS IN CORRECT MANNER FOR WHICH THEY WERE
R INTENDED. ADEQUATE VENTILATION AND USE OF
R PROTECTIVE GLOVES IS NECESSARY.

R CAUTION: SOLVENTS MAY ATTACK TRANSPARENT OR TRANSLUCENT
R PLASTICS, TAKE SPECIAL CARE NOT TO CONTAMINATE
R WINDOWS OR OTHER TRANSPARENT OR TRANSLUCENT
R PLASTICS.

R CAUTION: MASKING OF ADJACENT AREAS IS RECOMMENDED. PROTECT
R ALL PLASTIC SURFACES ADJACENT TO AREA BEING
R CLEANED FROM SOLVENT.

R (13) Clean soils caused by sealants, adhesives, paint, tar,
R asphalt, gum and similar materials by vacuuming area
R adjacent to soil to remove loose particles. Then
R saturate soiled area with solvent and allow to soak for
R approximately 30 seconds. Blot dissolved and loosened
R soil with dry wipers or paper towels. Repeat procedure
R until all soil is removed.

R NOTE: Take care that solvent does not wet adjacent
R clean areas and spread soil.

R NOTE: Clean cockpit area with wiper dampened with
R cleaning solution or solvent only.

R (14) Clean soiled area with detergent solution mixed and
R applied as specified in Step 3A(2). If slight traces
R of soil persist, wipe area, before brushing pile, with
R wiper dampened with solvent. Work in from surrounding
R area of spot to prevent spreading of soil.

R NOTE: Attach metal tags to all dispensing containers,
R except for ready packaged cleaners, to identify
R contents. Use polyethylene wash or spray
R bottles or dampened wipers to dispense detergent
R solutions or rinse water. Use polyethylene wash
R bottles to dispense solvents.

R NOTE: Apply cleaning solutions in cockpit area with
R wiper dampened with cleaning solution or solvent
R only.

R B. Regular cleaning (on-board) of upholstery and carpets

R (1) Vacuum upholstery or carpet thoroughly to remove loose R particles.

R (2) Mix shampoo solution in accordance with manufacturer's R instructions and work into thich foam. Work foam into R fabric, a small area at a time, with sponge or medium R fiber brush, using an over-lapping, circular motion.

R NOTE: Apply only foam from shampoo solution and never R liquid itself. Application of foam with R mechanical equipment is permissible.

R (3) Allow cleaned area to dry thoroughly and then vacuum to R remove dry foam. Gently brush pile to straighten and R lift the fibers.

R (4) Alternate procedure for cleaning of carpet and R upholstery, if soil or oder persists, use dry cleaning R compound. Place dry cleaning compound container R upsidedown for three minutes to ensure equal dispersion R of liquid through the compound.

R (5) Sprinkle dry cleaning compound liberally over soiled R area and rub in manually with medium fiber brush. R After three minutes remove compound with vacuum R cleaner.

R NOTE: Take care that compound does not get into gaps R in carpet, flooring, seat tracks, etc., and dry R cleaning compound method is not used unless this R occurrence can be completely eliminated.

R NOTE: In any area where silicone seals are used, clean R by mixing detergent in ratio of one part R detergent to ten parts water or in accordance R with the manufacturer's instructions. Apply R solution to surface with clean wiper. Blot R surface with wipers or paper towels. Repeat R procedure until surface is clean.

R C. Cleaning of glass mirrors and windows

R CAUTION: THE CLEANERS ARE FLAMMABLE AND SHOULD BE MIXED R AWAY FROM AIRCRAFT AND BROUGHT ON-BOARD ONLY IN R DILUTED CONDITION.

R (1) Mix glass cleaner and dilute in accordance with R manufacturers' instructions and applied with R polyethylene wash or spray bottle. Use clean dry wiper R to wipe off cleaner and loosened soil.

R NOTE: Take care not to scratch or abrade glass
R surface.

R (2) Apply approved liquid plastic cleaner to surface of
R windows and other transparent or translucent plastics
R using clean dry wiper. Allow to dry (4 to 10 minutes)
R and wipe with another clean, dry wiper to remove
R residue. Repeat procedure as necessary.

R NOTE: Take extreme care not to scratch or abrade
R window surface.

R D. Cleaning of rigid vinyl floor covering

R (1) Vacuum rigid vinyl floor covering to remove all loose
R particles.

R (2) Mix detergent as specified in Step 3A(2) and apply with
R medium fiber brush.

R (3) Wipe surface using clean wiper dampened with water to
R remove loosened and dissolved soil. Rinse area with
R clean water and dry using wipers or paper towels.
R Repeat procedure until all soil is removed.

R E. Cleaning of Decorative Surfaces

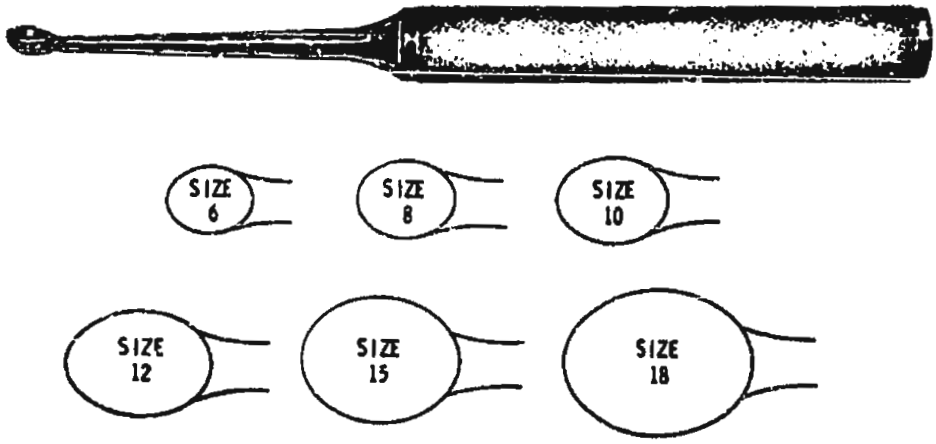
R (1) Mix detergent in ratio one part detergent to ten parts
R water or in accordance with manufacturer's
R instructions. Apply detergent solution to surface with
R spray or wash bottle or dampened wiper. Allow
R detergent solution to remain on surface up to two
R minutes or as recommended by manufacturer.

R NOTE: Use medium fiber brush in recessed areas where
R necessary.

R (2) Wipe surface clean using wiper dampened with clear
R water, rinse with clean wiper saturated with clear
R water and wipe dry with clean dry wiper. Repeat
R procedure as often as necessary till surface is clean.

R CAUTION: APPLY LIQUID PLASTIC CLEANER TO UNPAINTED
R THERMOPLASTICS ONLY.

R (3) Apply liquid plastic cleaner to surface using clean dry
R wiper. Allow to dry (four to ten minutes) and wipe
R with clean, dry wiper to remove residue. Repeat
R procedure as necessary.



NOTE:
EBONY STAINLESS STEEL.
LARGE, KNURLED HOLLOW HANDLE.
14' (35.5CM) LONG

M1-0000-20-808

R
R

Bone Scraper
Figure 201

R EFFECTIVITY: ALL
R
R
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